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Luther H. Hodges, *Secretary*

OFFICE OF TECHNICAL SERVICES
John C. Green, *Director*

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PROGRESS REPORT ON THE SKIN SCREENING OF 33 CS AND 50 EA TYPE COMPOUNDS. PRECLINICAL TOXICOLOGY STUDIES PROJECTED ON EA 2545, EA 3164, EA 3167, AND EA 3186.
AD-282 406 DIV. 3

***CHLORIDES**

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AD-282 521 DIV. 4

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***CHROMATOGRAPHIC ANALYSIS**

SHIPBOARD DETERMINATION OF DISSOLVED GASES IN SEA WATER BY GAS CHROMATOGRAPHY.
AD-282 870 DIV. 4

***CIRCUITS**

MICROCIRCUITRY DEVELOPED BY CHEMICALLY DEPOSITING NI ALLOY FILMS ON INSULATING SUBSTRATES AND CHEMICAL ETCHING PATTERNS IN THIN CU CONDUCTORS. RESISTIVE AND CONDUCTIVE PARTS MADE OF NI ALLOY FILMS OF APPROX. 500 OHMS PER SQUARE WERE USED.
AD-281 843 DIV. 8

SELF-ORGANIZING BINARY LOGICAL NETWORK IN

VCI OIL PROVED SUPERIOR TO MIL-L-21260 OIL FOR PRESERVING TANK ENGINES AFTER 3 YRS OUTDOOR STORAGE.
AD-282 328 DIV. 14

SENSITIVITY OF ELECTRICAL RESISTANCE CORROSION INDICATORS AND THE APPLICABILITY OF A CORROSOMETER TO THE EVALUATION OF CORROSION PREVENTIVE OILS AND COMPOUNDS.
AD-282 939 DIV. 30

*CORROSION-RESISTANT ALLOYS

CORRELATION OF TENSILE AND LONG TIME CREEP PROPERTIES TO HOT HARDNESS IS DESCRIBED FOR PH15-7MO-RH950 AND RENE' 41. THESE PROPERTIES WERE PLOTTED AGAINST A TIME TEMPERATURE PARAMETER AND THE RESULTS CROSS PLOTTED WITH VALUES OBTAINED SIMILARLY FOR HARDNESS.
AD-281 801 DIV. 17

RESULTS OF A STUDY OF THE SUSCEPTIBILITY OF VARIOUS HIGH STRENGTH MISSILE MATERIALS TO STRESS CORROSION CRACKING IN SYNTHETIC ENVIRONMENTS.
AD-281 881 DIV. 17

A NEW HARDENABLE HIGH-STRENGTH STAINLESS STEEL, STEEL AFC 77, WAS DEVELOPED. IT HAS HIGH STRENGTH (290,000 PSI TENSILE STRENGTH) AT THE AMBIENT TEMPERATURE AND RETAINS ITS STRENGTH WELL UP TO ABOUT 1200 F (120,000 PSI TENSILE STRENGTH AT 1200 F). IT HAS HIGHER STRENGTH, PARTICULARLY IN PROLONGED EXPOSURES, THAN ANY KNOWN STAINLESS STEEL.
AD-282 927 DIV. 17

*COSMIC RAY BURSTS

EFFECTS OF IONIZATION ON ELECTROMAGNETIC PHENOMENA IN THE TERRESTRIAL SYSTEM UNDER CONDITIONS OF EXTREMELY LOW FREQUENCY.
AD-282 030 DIV. 2

*COSMIC RAYS

THE RELATIVE ABUNDANCE OF NUCLEI HEAVIER THAN LITHIUM IN PRIMARY COSMIC RADIATION WAS INVESTIGATED USING PHOTOMETRIC MEASUREMENTS MADE ON 362 TRACKS OF HEAVY PRIMARY PARTICLES IN AN EMULSION STACK EXPOSED OVER TEXAS.
AD-282 243 DIV. 20

*COSTS

MATHEMATICAL ANALYSIS OF THE OPTIMUM BEHAVIOR OF A PERSON FORCED TO MAKE A DECISION BEFORE A SPECIFIED DEADLINE.
AD-282 447 DIV. 26

*COSTS
ANALYSIS

THE CRITICAL PATH METHOD, A QUANTITATIVE TOOL FOR BUSINESS DECISION MAKING, PROVIDES A TECHNIQUE FOR ANALYZING, PLANNING AND SCHEDULING LARGE, COMPLEX PROJECTS.
AD-282 450 DIV. 26

*COUPLED ANTENNAS

RESEARCH ON PROBLEMS RELATED TO ANTENNAS.
AD-281 741 DIV. 8

*CREEP

THE MATERIAL PARAMETERS INFLUENCING THE CREEP AND FATIGUE LIFE OF FILAMENT WOUND LAMINATES ARE INVESTIGATED.
AD-282 124 DIV. 14

TEMPERATURE DEPENDENCE OF REACTIONS WITH SPECIAL REFERENCE TO CREEP. KINETICS OF MULTISTEP, THERMALLY ACTIVATED REACTIONS ARE TREATED. THE CASE OF A STRESS-DEPENDENT REACTION INVOLVING STEPS WITH DIFFERENT STRESS FUNCTIONS IS DISCUSSED.
AD-282 804 DIV. 25

*CREEP
THEORY

A CREEP LAW, BASED ON LINEAR STRESS-STRAIN RELATIONS OF ELASTICITY, TO ACCOUNT FOR MATERIAL COMPRESSIBILITY.
AD-282 331 DIV. 17

*CRITICAL ASSEMBLIES

NUMERICAL SOLUTION OF THE TRANSPORT EQUATION FOR MONOENERGETIC NEUTRONS IN A MEDIUM WITH ISOTROPIC SCATTERING. TRUNCATION ERRORS.
AD-282 968 DIV. 30

*CRYOGENICS

A NEW PROGRAM TO STUDY DEFECTS IN SOLIDS BY ELECTRON-NUCLEAR DOUBLE RESONANCE TECHNIQUES AND A NEW METHOD OF LEVEL CROSSING SPECTROSCOPY IN WHICH BACKSCATTERED SIGNALS ARE UTILIZED, APPLIED TO ATOMIC COLLISION PHENOMENA IN RESONANCE STATES.
AD-282 410 DIV. 25

*CRYSTAL OSCILLATORS

RESISTANCE MEASUREMENTS OF 9TH, 5TH, AND 7TH HARMONICS OF 172 AND 174 MC QUARTZ CRYSTAL UNITS, CR-(XM-38)/U.
AD-282 962 DIV. 8

PILOT RUN PRODUCTION OF QUARTZ CRYSTAL UNITS MANUFACTURED OF BOTH NATURAL AND CULTURED QUARTZ. FREQUENCIES OF 150 MC, 162 MC, 174 MC, 188 MC, AND 200 MC.
AD-282 963 DIV. 8

PRODUCTION ENGINEERING MEASURE FOR VHF CRYSTAL UNITS CR(XM-36)/U. FREQUENCIES ARE 150 MC, 162 MC, 174 MC, 188 MC, AND 200 MC.
AD-282 964 DIV. 8

QUARTZ CRYSTAL UNITS OF BOTH NATURAL AND CULTURED QUARTZ. FREQUENCIES OF 150 MC, 162 MC, 174 MC, 188 MC, AND 200 MC. PILOT RUN PRODUCTION TECHNIQUES.
AD-282 965 DIV. 9

*CRYSTAL STRUCTURE

THE TIGHT-BINDING METHOD FOR THE CALCULATION OF ONE-ELECTRON STATES IN SOLIDS IS APPLIED TO THE S-STATES OF THE OUTERMOST ION-CORE ELECTRONS OF LITHIUM, SODIUM, AND POTASSIUM.
AD-281 716 DIV. 25

EFFECTS OF SURFACE AND ENVIRONMENT ON THE MECHANICAL PROPERTIES OF MATERIALS. EFFECTS OF ADSORBED POLAR MOLECULES ON THE MECHANICAL AND DISSOLUTION BEHAVIOR OF IONIC CRYSTALS. REBINDER EFFECT. ETCH-TUNNELING PHENOMENA. SURFACE SENSITIVE BEHAVIOR OF IONIC CRYSTALS. EMBRITTLEMENT BY LIQUID METALS.
AD-282 880 DIV. 14

*CRYSTAL STRUCTURE
CADMIUM

THE FORMATION AND PROPERTIES OF A TYPE OF HEXAGONAL NETWORK IN THIN CRYSTALS OF CD ARE DESCRIBED. THE NETWORKS APPEAR ALMOST IMMEDIATELY AFTER THE DISAPPEARANCE OF VACANCY-TYPE LOOPS INTRODUCED BY BOMBARDING THE CRYSTALS WITH NEGATIVE IONS.
AD-281 779 DIV. 25

*CRYSTAL STRUCTURE
TABLES

ELECTRONIC SPECTRA OF TRANSITION METAL IONS IN CRYSTALS. TABLES OF FUNDAMENTALS OF CRYSTAL FIELD THEORY.
AD-282 494 DIV. 25

*CRYSTALS

NUCLEATION IN CONDENSATION FROM THE VAPOR PHASE ONTO A SUBSTRATE.
AD-282 159 DIV. 25

EFFECTS OF SURFACE AND ENVIRONMENT ON THE MECHANICAL PROPERTIES OF MATERIALS. EFFECTS OF ADSORBED POLAR MOLECULES ON THE MECHANICAL AND DISSOLUTION BEHAVIOR OF IONIC CRYSTALS. REBINDER EFFECT. ETCH-TUNNELING PHENOMENA. SURFACE SENSITIVE BEHAVIOR OF IONIC CRYSTALS. EMBRITTLEMENT BY LIQUID METALS.
AD-282 880 DIV. 14

TOTAL MAGNETIC SUSCEPTIBILITY OF THE MAGNETIC STRUCTURE OF RUBY EXPLORED. SURVEY OF RECENT DEVELOPMENTS IN THE FIELDS.
AD-283 066 DIV. 25

*CRYSTALS
ELECTRODES

THE INFLUENCE OF THE CRYSTALLOGRAPHIC ORIENTATION OF ELECTRODE SURFACES ON HYDROGEN OVERVOLTAGE WAS INVESTIGATED. THE SINGLE AND POLYCRYSTALLINE ELECTRODES STUDIED INCLUDED AG, CU, CD, PT, SB, AU, SN, ZN, PB AND NI ELECTRODES.
AD-281 805 DIV. 7

*CRYSTALS
MECHANICAL PROPERTIES

EFFECT OF ALLOYING, TEMPERATURE, STRESS, AND TESTING ENVIRONMENT ON THE TIME-DEPENDENT SLIDING OF TWO GRAINS AT A COMMON PLANE GRAIN BOUNDARY IN BICRYSTAL SPECIMENS OF COPPER.
AD-282 400 DIV. 17

*CRYSTALS
METALLIC SMOKE DEPOSITS

PAPERS ON CHEMICAL VAPOR DEPOSITION INCLUDING POSSIBILITIES AND PROBLEMS OF CHEMICAL VAPOR DEPOSITION, GROWTH OF CRYSTALLINE FILMS, WHISKER GROWTH, VAPOR DEPOSITION OR DIFFUSION COATING, VAPOR-PHASE TRANSFER PROCESSES.
AD-281 887 DIV. 25

*CYANO RADICALS

THERMAL DIFFERENTIAL ANALYSIS OF CYANO-TRANSITION METAL COMPLEXES.
AD-282 397 DIV. 4

*CYLINDRICAL BODIES

MEASUREMENT OF PRESSURES, FORCES AND RADIATING WAVES FOR CYLINDERS OSCILLATING IN A FREE SURFACE.
AD-281 732 DIV. 9

AN APPROXIMATE SOLUTION OF THE EQUATION WHICH GOVERNS THE INVISCID MODES OF INSTABILITY OF STEADY FLOW BETWEEN CONCENTRIC ROTATING CYLINDERS IS DERIVED.
AD-282 126 DIV. 9

STAGNATION POINT HEAT TRANSFER RATES OF CYLINDERS AND SPHERES IN HYPERSONIC LOW REYNOLDS NUMBER FLOWS.
AD-282 735 DIV. 9

SUMMARY OF WORK PREVIOUSLY REPORTED ON STATIC STRESS AND STABILITY ANALYSES OF REINFORCED AND UNREINFORCED CYLINDRICAL SHELLS.
AD-282 792 DIV. 25

A TEST TO DETERMINE THE RELIABILITY OF ANALYTICAL METHODS OF DESIGN OF ALUMINUM HONEYCOMB SANDWICH CYLINDERS IN THE EULER BUCKLING RANGE. TWO LONG ALUMINUM HONEYCOMB SANDWICH CYLINDERS WERE CONSTRUCTED AND TESTED TO DESTRUCTION TO DETERMINE THEIR LOAD-CARRYING, BUCKLING AND POSSIBLE POST-BUCKLING RESPONSES.
AD-282 816 DIV. 12

*CYLINDRICAL BODIES
DRAG

MINIMIZATION OF DRAG OF A SLENDER BODY OF REVOLUTION IN HYPERSONIC FLOW ANALYZED USING THE NEWTON-BUSEMANN PRESSURE COEFFICIENT LAW TO INCLUDE CENTRIPETAL ACCELERATION EFFECTS.
AD-283 011 DIV. 9

*CYLINDRICAL BODIES
STRESSES

A STRESS-STRAIN RELATION IS FORMULATED FOR INELASTIC MATERIAL BEHAVIOR BASED ON THE RAMBERG-OSGOOD UNIAXIAL LAW, PRAGER'S GENERAL STRAIN-HARDENING RELATION, AND HENCKY'S HYPOTHESIS.
AD-282 160 DIV. 25

*DAMS

COMPUTER PROGRAMMING FOR COMPUTATION OF STRESSES IN REINFORCEMENT STEEL AND PENSTOCK LINERS EMBEDDED IN CONCRETE DAMS.
AD-282 830 DIV. 30

*DATA PROCESSING SYSTEMS

INFORMATION RETRIEVAL SYSTEMS APPLIED TO THE COMPILING AND ANALYZING OF DATA ON SHOCK DAMAGE TO SHIPBOARD EQUIPMENT IS AN UNDERWATER EXPLOSION ENVIRONMENT.
AD-281 826 DIV. 30

THREE SMALL LIBRARIES ON DISTINCT SUBJECTS ARE INVENTORIED TO ASCERTAIN HOW CLEANLY THE HOMOGRAPHS ARE SEPARATED AS A CONSEQUENCE OF SEPARATING THE SAMPLE LIBRARIES.
AD-281 909 DIV. 32

STUDY OF FACSIMILE SCANNING AND RECORDING TECHNIQUES EMPLOYING FIBER OPTICS AND RESULTS OF EXPERIMENTATION WITH DIFFERENT TYPES OF FIBERS.
AD-281 914 DIV. 9

AN OPEN-ENDED DATA PROCESSOR IS DESCRIBED. THE REDACTOR IS USED FOR REDUCING NONCOMPUTER-COMPATIBLE INFORMATION INTO A FORM WHICH A LARGE DIGITAL COMPUTER CAN USE.
AD-282 191 DIV. 30

A RESEARCH STUDY AND EXPERIMENTAL INVESTIGATION OF TECHNIQUES AND EQUIPMENT CHARACTERISTICS OF PATTERN RECOGNITION SYSTEMS FOR PRACTICAL APPLICATION TO GRAPHICAL DATA PROCESSING FOR MILITARY REQUIREMENTS.
AD-282 613 DIV. 30

INVESTIGATIONS IN COMPUTER-AIDED DESIGN FOR THE APPLICATION OF CONCEPTS AND TECHNIQUES OF MODERN DATA PROCESSING TO THE DESIGN OF MECHANICAL PARTS, AND THE DEVELOPMENT OF AUTOMATIC PROGRAMMING SYSTEMS FOR NUMERICALLY CONTROLLED MACHINE TOOLS.
AD-282 679 DIV. 30

DESIGN STUDY OF AN AUTOMATIC MONITORING SYSTEM FOR FLIGHT SIMULATORS.
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*DATA STORAGE SYSTEMS

A RESEARCH STUDY AND EXPERIMENTAL INVESTIGATION OF TECHNIQUES AND EQUIPMENT CHARACTERISTICS OF PATTERN RECOGNITION SYSTEMS FOR PRACTICAL APPLICATION TO GRAPHICAL DATA PROCESSING FOR MILITARY REQUIREMENTS.
AD-282 613 DIV. 30

AND ITS ERROR-CORRECTION CAPABILITIES.
AD-282 944 DIV. 30

*COMPUTERS

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AD-282 363 DIV. 30

AN IMPROVED BUSINESS-ORIENTED COMPUTER LANGUAGE.
AD-282 608 DIV. 32

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AD-282 931 DIV. 30

*COMPUTERS
PROGRAMMING

FRANKFORD ARSENAL MULTISYSTEM TEST EQUIPMENT PROGRAM. LABORATORY AUTOMATIC CHECKOUT PROJECT. INPUT-OUTPUT BUFFER SYSTEM. TAPE-TUB DEVELOPMENT. CONVERTER DEVELOPMENT. SYSTEM INTERFACE SPECIFICATIONS. COMPILER PROGRAM.
AD-282 664 DIV. 31

*CONDENSATION

NUCLEATION IN CONDENSATION FROM THE VAPOR PHASE ONTO A SUBSTRATE.
AD-282 159 DIV. 25

*CONFERENCES

SYMPOSIUM ON STRUCTURAL AND MATERIAL REQUIREMENTS OF SPACE VEHICLES EXPOSED TO AERODYNAMIC HEATING PARTICULARLY DURING RE-ENTRY.
AD-282 454 DIV. 1

*CONICAL ANTENNAS

RESEARCH ON PROBLEMS RELATED TO ANTENNAS.
AD-281 741 DIV. 8

POLYGONAL SPIRAL ANTENNAS CAPABLE OF FREQUENCY INDEPENDENT PERFORMANCE: SIMILAR BEHAVIOR WHEN COMPARED WITH LOG-SPIRAL ANTENNAS.
AD-281 782 DIV. 8

*CONICAL BODIES
HYPERSONICS

WEAK-INTERACTION, SELF-INDUCED PRESSURES ON CONES AT MACH 11 IN AIR WITH VARYING ANGLE OF ATTACK.
AD-282 681 DIV. 9

BLUNT SLENDER CONE HYPERSONIC STABILITY.
AD-282 897 DIV. 9

*CONSUMPTION

FOOD PREFERENCES IN A STRESSFUL SITUATION USING SOLDIERS IN PARATROOPER TRAINING. FIFTY FOODS AND FOUR STRESSFUL SITUATIONS. PREFERENCE FOR MAIN DISHES HIGHER UNDER STRESS CONDITIONS THAN UNDER RECOVERY FROM STRESS. LEVEL OF STRESS POSSIBLY NOT HIGH ENOUGH FOR SIGNIFICANT FINDINGS.
AD-282 975 DIV. 28

*CONTAINERS
STEEL

TWO METHODS OF REMOVING ASPHALT FROM DRUMS WERE DEVELOPED (1) INSIDE OF DRUMS IS COATED WITH CHEMICAL RELEASE AGENT TO ALLOW ASPHALT TO BE TAKEN FROM CUT DRUMS; (2) DRUM IS IMMERSED IN HOT WATER, ALLOWING ASPHALT SLUG TO SLIDE OUT.
AD-282 938 DIV. 14

*CONTINUED FRACTIONS

APPLICATIONS OF THE QUOTIENT-DIFFERENCE ALGORITHM TO LOCATING ZEROS OF ANALYTIC FUNCTION AND TO COMPUTATION OF CONVERGENCE FACTORS FOR ASYMPTOTIC EXPANSIONS.
AD-283 112 DIV. 19

*CONTINUUM MECHANICS

BY APPLICATION TO THE BOLTZMANN EQUATION OF A NEW PERTURBATION METHOD WHICH ALLOWS PROPER TREATMENT OF LONG TIME OR PERSISTANT EFFECTS IT IS DESCRIBED BOTH THE TRANSIENT AND THE LONG-TIME BEHAVIOR OF A SIMPLE GAS AS IT RELAXES INTO THE CONTINUUM REGIME.
AD-282 606 DIV. 29

*CONTROL

ADAPT: A SYSTEM FOR THE AUTOMATIC PROGRAMMING OF NUMERICALLY-CONTROLLED MACHINE TOOLS ON SMALL COMPUTERS.
AD-281 884 DIV. 30

*CONTROL KNOBS

PURPOSES OF CONTROL CODING AND STANDARDIZING CONTROL CODING. LOCATION CODING, LABELING, COLOR CODING, SHAPE CODING, SIZE CODING, AND MODE OF OPERATION CODING. PRIORITY ASSIGNMENTS TO CONTROLS. PHYSICAL, PHYSIOLOGICAL, AND PSYCHOLOGICAL CONSIDERATIONS IN CODING.
AD-282 139 DIV. 28

*CONTROL PANELS

PURPOSES OF CONTROL CODING AND STANDARDIZING CONTROL CODING. LOCATION CODING, LABELING, COLOR CODING, SHAPE CODING, SIZE CODING, AND MODE OF OPERATION CODING. PRIORITY ASSIGNMENTS TO CONTROLS. PHYSICAL, PHYSIOLOGICAL, AND PSYCHOLOGICAL CONSIDERATIONS IN CODING.
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*CONTROL PANELS
ANTISUBMARINE WARFARE

DESIGN OF AUDIO CONTROL AND MONITOR PANELS FOR ASW FLIGHT TEST PURPOSES: ROUTING AND RECEIVING AUDIO INFORMATION FROM PROJECT RECEIVERS ON P2V-7 AIRCRAFT.
AD-282 889 DIV. 6

*CONTROL STICKS

PURPOSES OF CONTROL CODING AND STANDARDIZING CONTROL CODING. LOCATION CODING, LABELING, COLOR CODING, SHAPE CODING, SIZE CODING, AND MODE OF OPERATION CODING. PRIORITY ASSIGNMENTS TO CONTROLS. PHYSICAL, PHYSIOLOGICAL, AND PSYCHOLOGICAL CONSIDERATIONS IN CODING.
AD-282 137 DIV. 28

*CONTROL SYSTEMS

THE USE OF IMPULSIVE TORQUING TO CONTROL THE ATTITUDE OF METEOROLOGICAL ROCKETS IS DISCUSSED.
AD-281 711 DIV. 2

BASIC THEORETICAL RESEARCH IN CONTROL SYSTEMS IS REVIEWED.
AD-281 761 DIV. 30

THE PERFORMANCE OF AN OPTIMAL CONTROL SYSTEM IS COMPARED TO THAT OF A CONTROL SYSTEM CONSIDERED AS SUBOPTIMAL FOR NON-TRIVIAL SITUATIONS WHERE UNCERTAINTIES REGARDING THE FUTURE BEHAVIOR OF THE MACHINE OR ITS ENVIRONMENT EXIST.
AD-281 906 DIV. 30

APPLICATION OF PONTRYAGIN'S MAXIMUM PRINCIPLE LINEAR CONTROL SYSTEMS.
AD-282 339 DIV. 26

A GEOMETRICAL APPROACH TO THE TIME-OPTIMAL CONTROL OF GENERAL LINEAR PLANTS WITH GENERALIZED CONSTRAINTS ON THE CONTROL VARIABLE.
AD-282 361 DIV. 30

AN ANALYTICAL DETERMINATION OF THE EXISTENCE OF OPTIMUM POINTS IN A CLASS OF NETWORKS INCLUDING CLOSED-LOOP FEEDBACK SYSTEMS AS WELL AS PASSIVE NETWORKS.
AD-282 413 DIV. 12

EVALUATION OF SPECIAL CONTROL COMPONENTS. USE OF SILICON CONTROLLED RECTIFIERS WITH DC SERVO MOTORS. PRINTED CIRCUIT MOTOR. DC VOLTAGE COMPARATOR. SERVO AMPLIFIERS. HIGH FREQUENCY RESOLVER. SILICON FIELD-EFFECT TRANSISTORS. VHF SEMICONDUCTOR COAXIAL SWITCH.
AD-283 088 DIV. 8

*CONTROL SYSTEMS
BIBLIOGRAPHY

BIBLIOGRAPHY OF SELF-ADAPTIVE CONTROL SYSTEM FOR LARGE BOOSTER ROCKETS TO PREVENT INSTABILITY CAUSED BY FUEL SLOSHING AND BODY BENDING.
AD-282 477 DIV. 12

*CONTROL SYSTEMS
SATELLITE VEHICLES

SATELLITE INERTIA-WHEEL ATTITUDE CONTROL ON ELLIPTICAL ORBITS. TWO-PART PERTURBATION ANALYSIS REFERENCE-MOTION SOLUTION.
AD-282 776 DIV. 12

*CONTROL SYSTEMS
SERVO SYSTEMS

NEW LONGITUDINAL HANDLING QUALITIES PARAMETERS ASSOCIATED WITH THE NUMERATOR TERMS IN THE AIRFRAME LONGITUDINAL TRANSFER FUNCTION.
AD-282 879 DIV. 1

*CONTROL SYSTEMS
SPACE FLIGHT

OPTICAL CONTROL SYSTEM FOR ACHIEVING A SOFT PLANETARY LANDING.
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*CONVALESCENCE

FOLLOW-UP OF ACUTE HEPATITIS CASES TREATED DURING 1951-1952. NO EVIDENCE THAT STRICT BED REST IS SUPERIOR TO AD LIB BED REST. NO COMPLICATIONS WITH GRADUAL RESUMPTION OF ACTIVITY DURING CONVALESCENCE. PERIOD OF ACUTE ILLNESS SHORTENED BY 20% WITH FORCED HIGH PROTEIN DIET.
AD-282 190 DIV. 14

*CONVECTION

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*CONVEX SETS

BOUNDED LINEAR OPERATORS IN BANACH SPACES.
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CONVEXITY THEOREMS AND LOWER BOUNDS FOR SOLUTIONS OF DIFFERENTIAL EQUATIONS IN BANACH SPACE.
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*COOLING

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AD-281 854 DIV. 17

*COPPER

EFFECT OF ALLOYING, TEMPERATURE, STRESS, AND TESTING ENVIRONMENT ON THE TIME-DEPENDENT SLIDING OF TWO GRAINS AT A COMMON PLANE GRAIN BOUNDARY IN BICRYSTAL SPECIMENS OF COPPER.
AD-282 400 DIV. 17

A STUDY WAS MADE OF ONE-DIMENSIONAL WAVE PROPAGATION IN AND ABOVE THE ELASTIC RANGE IN RODS OF 24ST AL, 1018 STEEL, AND CU. THE WAVES ARE THEORETICALLY DESCRIBED AS CONSISTING OF A FRONT OF DECREASING STEEPNESS FOLLOWED BY A ZONE OF INELASTIC SLIP. STRAIN GAGE MEASUREMENTS WERE USED TO VERIFY THEORY.
AD-282 808 DIV. 17

*COPPER ALLOYS
DEFORMATION

EFFECT OF COLD-WORK ON THE X-RAY DIFFRACTION PATTERN OF CU-SI-MN ALLOYS.
AD-282 054 DIV. 17

*CORRELATION TECHNIQUES

A MATHEMATICAL PROCEDURE FOR SELECTING AN ACQUIRABLE CODE IS DESCRIBED.
AD-281 751 DIV. 6

THE DETERMINATION OF IMPULSE RESPONSE OF A LINEAR SYSTEM BY THE USE OF CORRELATION TECHNIQUES AND DIRECT MEASUREMENT.
AD-281 770 DIV. 8

*CORROSION

STRESS CORROSION FOR VARIOUS STRUCTURAL ALLOYS AT ROOM AND ELEVATED TEMPERATURE. QUANTITY OF SEA SALT AND THICKNESS OF ANODIZED FILM IN ELEVATED TEMPERATURE STRESS-CORROSION CRACKING OF TITANIUM ALLOYS.
AD-281 712 DIV. 17

*CORROSION
METERS

SENSITIVITY OF ELECTRICAL RESISTANCE CORROSION INDICATORS AND THE APPLICABILITY OF A CORROSOMETER TO THE EVALUATION OF CORROSION PREVENTIVE OILS AND COMPOUNDS.
AD-282 937 DIV. 30

*CORROSION INHIBITION

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AD-281 905 DIV. 17

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***DILATOMETERS**

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***DIODES**

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AD-281 867 DIV. 8

VARACTOR MICROWAVE FREQUENCY MULTIPLIERS - VARACTOR HARMONIC GENERATORS AND CIRCUITS EMPLOYING REACTIVE NONLINEARITY. DESIGN PROCEDURES AND LABORATORY TECHNIQUES ARE PRESENTED TO ELIMINATE CHARACTERISTIC PROBLEMS IN THE ABOVE DEVICES.
AD-282 191 DIV. 8

EVALUATION OF PROCESS REFINEMENT ON THE ACCELERATED OXIDATION PASSIVATION OF DIODES AND RECTIFIERS. LOW TEMPERATURE GLASS PASSIVATION OF SILICON PLANAR TRANSISTORS.
AD-282 314 DIV. 8

HIGH PURITY TANTALUM BEING ELECTRICALLY STABLE, USED FOR DIODES AND TRIODES. MADE FROM TANTALUM, TANTALUM OXIDE, SILICON, COPPER, ALUMINUM, AND GOLD, FOR TUNNEL EMISSION AMPLIFIERS.
AD-282 412 DIV. 8

***DIODES**
**AMPLIFIERS**

TUNNEL DIODE DETECTOR WITH SMALL SIGNAL GAIN AT ABOUT 15; TUNNEL DIODE CIRCUITS AS PRACTICAL IF THE INPUT SIGNAL IS AN AMPLITUDE MODULATED WAVE WITH A SMALL PERCENTAGE OF MODULATION.
AD-282 917 DIV. 8

***DIODES**
**CESIUM**

A CS DIODE THERMIONIC CONVERTER USING A NB EMITTER AND MO COLLECTOR WAS TESTED FOR PERFORMANCE.
AD-282 899 DIV. 7

***DIODES**
**DESIGN**

EPITAXIAL GROWTH TECHNIQUES. PHOSPHORUS DIFFUSION FOR DETERMINATION OF P-TYPE EPITAXIAL LAYER DOPING IMPURITY PROFILES. PHOSPHINE DOPED ARGON FOR CONTROLLING RESISTIVITY OF AN N-TYPE EPITAXIAL LAYER. GROWTH OF MULTI-EPITAXIAL LAYER STRUCTURES COMBINED WITH EFFECTIVE OXIDE MASKING.
AD-282 249 DIV. 9

***DIPOLE ANTENNAS**

RESEARCH ON PROBLEMS RELATED TO ANTENNAS.
AD-281 781 DIV. 8

THEORETICAL DERIVATIONS AND NUMERICAL CALCULATIONS OF THE ELECTRICAL DIPOLE MOMENT AND THE FAR FIELDS FROM A TRAILING WIRE ANTENNA.
AD-282 155 DIV. 8

EARTH PROBE ANTENNA RECEPTION OF COHERENCE AND SFERIC SIGNALS BELOW 50 KC COMPARED WITH RECEPTION OF HORIZONTAL OVERHEAD ANTENNAS; HIGHER SIGNAL-TO-NOISE RATIO INDICATED EARTH PROBE ANTENNA SUPERIOR FOR MANY APPLICATIONS.
AD-282 173 DIV. 9

ELECTRONIC RECONNAISSANCE ANTENNAS. BROADBAND LOW-NOISE AMPLIFIER AND MIXER CIRCUITS SUITABLE FOR INTEGRATION INTO AN ANTENNA. ANTENNAFIER TECHNIQUES TO CONTROL THE ECHO AREA OF BODY-ANTENNA SYSTEMS.
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***DRY CELLS**
**DESIGN**

THE BA-2270/U BATTERY IN THE CATHODIC ENVELOPE CONSTRUCTION GIVES AN ACTUAL INITIAL LOW TEMPERATURE SERVICE LEVEL EQUIVALENT TO 3 TO 4 TIMES THAT OBTAINED UNDER OTHER CONTRACTS.
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***ELECTRICAL NETWORKS**

THE MOST GENERAL PROCEDURE FOR FINDING MINIMUM CONTACT SPRING NETWORKS IS DESCRIBED. THE PROGRAMMING OF THESE PROCEDURES WITH THE AID OF AN IBM 650 COMPUTER IS DISCUSSED.
AD-282 032 DIV. 15

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***ELECTRICAL NETWORKS**
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AD-283 083 DIV. 8

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***ELECTRODES**

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***ELECTRODES**
**ELECTRIC POTENTIAL**

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**KINETIC THEORY**

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***ELECTRODES**
**METALLIC CRYSTALS**

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***ELECTRODES**
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***ELECTROENCEPHALOGRAPHY**

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***ELECTROLYTES**

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AD-282 377 DIV. 25

ULTRASONIC RELAXATION IN ELECTROLYTIC SOLUTIONS IS REVIEWED WITH PARTICULAR REFERENCE TO SOLUTIONS OF ELECTROLYTES. A BRIEF SURVEY OF EXPERIMENTAL METHODS FOR MEASURING ULTRASONIC ABSORPTION IS GIVEN.
AD-282 814 DIV. 4

***ELECTROLYTIC CELLS**

THE RA-2270/U BATTERY IN THE CATHODIC ENVELOPE CONSTRUCTION GIVES AN ACTUAL INITIAL LOW TEMPERATURE SERVICE LEVEL EQUIVALENT TO 3 TO 4 TIMES THAT OBTAINED UNDER OTHER CONTRACTS.
AD-282 174 DIV. 7

ENERGY CONVERSION STUDY OF NICKEL OXIDE, ZINC OXIDE, ANTHRACENE, AND PHENANTHRENE SEMICONDUCTOR ELECTRODES.
AD-282 849 DIV. 25

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***ELECTROLYTIC CELLS**
**REACTION KINETICS**

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AD-282 922 DIV. 4

***ELECTROMAGNETIC FIELDS**

A FORMALISM IS DEVELOPED, EMPLOYING AN IMPROVED SEMI-CLASSICAL THEORY OF ELECTRODYNAMICS WITH WHICH IT IS POSSIBLE TO TREAT INTERACTING SYSTEMS OF RADIATION AND LARGE OR SMALL NUMBERS OF ATOMS.
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AD-282 167 DIV. 9

A METHOD FOR THE ANALYTICAL TREATMENT OF RADIO PHENOMENA IN THE TERRESTRIAL MAGNETOSPHERE.
AD-282 401 DIV. 2

A STUDY OF EQUILIBRIUM BETWEEN THERMIONIC EMISSION FROM SOLID AND SPACE CHARGES OF THE PHASES IN A GAS-SOLID SUSPENSION AT HIGH TEMPERATURES IS PRESENTED.
AD-282 604 DIV. 25

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AD-282 916 DIV. 25

***ELECTROMAGNETIC PROPERTIES**

ELECTROMAGNETIC PHENOMENA OBSERVED IN RELATIVE INTERMOLECULAR OR IONIC MOTION IN FLUID FLOWS ARE DISCUSSED. ELECTROGASDYNAMICS.
AD-282 167 DIV. 9

A GENERAL APPROACH TO THE SOLUTION OF PULSE SCATTERING BY FINITE OBSTACLES IS FORMULATED FEATURING THE IDENTIFICATION AND SEPARATE TREATMENT OF THE INDIVIDUAL TERMS IN A WAVEFRONT EXPANSION OF THE WAVEFORMS OF THE FIELD VECTORS.
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***ELECTROMAGNETIC SHIELDING**

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AD-282 442 DIV. 8

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AD-282 513 DIV. 12

***ELECTROMAGNETIC THEORY**

EQUATIONS FOR SINGLE PROPAGATORS OF SELF-COUPLED MESON FIELD. THEIR SOLUTION FOR A NUMERICAL MODEL. CONSIDERATIONS ON THE CONVERGENCE OF PERTURBATIVE EXPANSIONS.
AD-281 803 DIV. 20

A STUDY IS PRESENTED WHICH CONCERNS THE INVESTIGATION OF THE RELATIONSHIP OF ELECTROMAGNETIC THEORY TO GEOMETRICAL OPTICS.
AD-282 481 DIV. 25

AN APPROACH TO STATIONARY FORMS OF EXPRESSIONS FOR CERTAIN QUANTITIES SUCH AS THE SELF-IMPEDANCE OF AN ANTENNA AND THE RADIATION PATTERN.
AD-283 918 DIV. 25

***ELECTROMAGNETIC THEORY**
**BOUNDARY LAYER**

A STOCHASTIC GENERALIZATION OF THE GREEN-SOLF COMPLEX SCALAR POTENTIAL OF ELECTROMAGNETIC THEORY: THE LUNEBERG DIFFRACTION THEORY AND ITS RAMIFICATIONS: DIFFRACTION BY A HIGH-NUMERICAL APERTURE FOR UNPOLARIZED LIGHT.
AD-281 899 DIV. 9

***ELECTROMAGNETIC WAVE REFLECTIONS**

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AD-282 381 DIV. 2

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AD-283 019 DIV. 25

***ELECTROMAGNETIC WAVES**

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AD-281 771 DIV. 2

FEASIBILITY OF USING LAYERS OF DRY ROCK AS AN UNDERGROUND PROPAGATION MEDIUM FOR RADIO WAVES.
AD-281 806 DIV. 8

RADIATION CHARACTERISTICS FROM A PLASMA SLAB ON A PERFECTLY CONDUCTING PLANE EXCITED BY A MAGNETIC LINE SOURCE PARALLEL TO THE DC MAGNETIC FIELD.
AD-281 816 DIV. 8

THE RADIATION OF ELECTROMAGNETIC ENERGY IN AN ANISOTROPIC PLASMA EXCITED BY A FINITE CURRENT DISTRIBUTION IS DISCUSSED.
AD-282 156 DIV. 25

ELECTROMAGNETIC PHENOMENA OBSERVED IN RELATIVE INTERMOLECULAR OR IONIC MOTION IN FLUID FLOWS ARE DISCUSSED. ELECTROGASDYNAMICS.
AD-282 167 DIV. 9

IT IS PROVEN THAT: IN THE PROPAGATION OF ELECTROMAGNETIC WAVES ACROSS AN ELECTROMAGNETIC FIELD IN THE STEADY-STATE PHASE, NO TRANSFER OF ENERGY TAKES PLACE FROM THE PLASMA TO THE ELECTOMAGNETIC FIELD OR VICE VERSA.
AD-282 234 DIV. 9

FORMULAS FOR THE SIGNAL DUE TO PLASMA FLOW WITH TENSOR CONDUCTIVITY, CONSIDERING E-LAMINATION AND PANNAE-CIL TRANSDUCERS.
AD-282 385 DIV. 25

A NEW PROGRAM TO STUDY DEFECTS IN SOLIDS BY ELECTRON-NUCLEAR DOUBLE RESONANCE TECHNIQUES AND A NEW METHOD OF LEVEL CROSSING SPECTROSCOPY IN WHICH BACKSCATTERED SIGNALS ARE UTILIZED, APPLIED TO ATOMIC COLLISION PHENOMENA IN RESONANCE STATES.
AD-282 410 DIV. 25

THE PROPAGATION CHARACTERISTICS OF SMALL-AMPLITUDE WAVES IN HOT PLASMAS ARE DISCUSSED ASSUMING SPECIFIC FUNCTIONAL FORMS FOR THE EQUILIBRIUM DISTRIBUTIONS.
AD-282 740 DIV. 25

EXPERIMENTAL RESULTS ARE COMPARED WITH THE THEORY OF RADIATION FROM A HORIZONTAL ELECTRIC DIPOLE ANTENNA SUBMERGED IN THE SEA.
AD-282 786 DIV. 4

THE EFFECT OF VARYING PRESSURE AND DENSITY OF THE AMBIENT MEDIUM OF BLAST WAVES AND SOME HEAT FLOW AND ENERGY LOSS DUE TO RADIATION. ALSO A NEW APPROACH TO AXIAL SYMMETRIC BLAST WAVES.
AD-282 806 DIV. 25

FIVE THEORETICAL PLASMA STUDIES.
AD-282 894 DIV. 25

***ELECTROMAGNETIC WAVES**
**ABSORPTION**

TYPICAL ABSORPTION CURVES FOR MAGNETO-IONIC

*EARTHQUAKES

S-WAVE STUDIES OF EARTHQUAKES OF THE NORTH PACIFIC. PART II ALEUTIAN ISLANDS.
AD-282 146 DIV. 2

*ECONOMIC CONDITIONS

CLARIFICATION OF THE ECONOMIC IMPLICATIONS OF ARROW'S IMPOSSIBILITY THEOREM OF THE WELFARE FUNCTION. STUDY OF HOW THE SOCIAL WELFARE FUNCTION WORKS. IF THE CHOICE FUNCTION IS RESTRICTED TO THE DEMAND FUNCTION.
AD-282 106 DIV. 15

*ECONOMICS

PROGRAM FOR COMPUTER CALCULATION OF FIRM POWER RATE FOR POWER SYSTEM PAYOUT.
AD-283 047 DIV. 32

*ECONOMICS
APPLIED MATHEMATICS

AN ATTEMPT WAS MADE TO ANSWER 2 QUESTIONS WHAT IS THE OPTIMAL LEVEL OF EXPENDITURES BY A GIVEN FIRM, ON RESEARCH AND DEVELOPMENT. HOW DOES THIS TYPE OF INVESTMENT RELATE TO THE MARKET STRUCTURE IN WHICH THE FIRM OPERATES.
AD-282 107 DIV. 32

*ECONOMICS
THEORY

ADAPTIVE PROCESSES IN ECONOMIC SYSTEMS, WITH REFERENCE TO SOCIAL SYSTEMS, BIOLOGICAL SYSTEMS, AND CYBERNETICS. DETERMINISTIC, STOCHASTIC, AND ADAPTIVE STOCHASTIC DYNAMIC ECONOMIC PROCESS. THE BINOMIAL INVESTMENT PROCESS AND INVESTMENT PROCESSES OTHER THAN BINOMIAL STATISTICAL EQUILIBRIUM IN THE MARKET.
AD-282 146 DIV. 32

*EDUCATION

SELF-RATINGS OF APTITUDES BY HIGH SCHOOL STUDENTS FOUND RELATED TO VOCATIONAL DEVELOPMENTAL PROGRAMS BUT A HIGHER CORRELATION BETWEEN APTITUDE TEST AND ACHIEVEMENT.
AD-282 481 DIV. 23

IMPRINTING OF ATTITUDES TOWARDS CAREER AND MARRIAGE UPON THE LIFE STYLES OF YOUNG WOMEN.
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PSYCHOLOGY

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AD-282 531 DIV. 28

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AD-282 532 DIV. 28

*ELASTIC SCATTERING

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AD-282 900 DIV. 20

*ELASTIC SHELLS

EQUATIONS FOR COMPUTING THE STRESSES IN TWO THIN SHELLS OF DIFFERENT GEOMETRIC, ELASTIC AND THERMAL PROPERTIES JOINED BY AN ELASTIC RING.
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*ELASTICITY

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AD-282 132 DIV. 25

THERMO-VISCOELASTIC STRESSES IN A SPHERICAL CAVITY ARE ANALYZED FOR UNIFORM INITIAL TEMPERATURE AND CAVITY ABLATION AT AN ELEVATED CONSTANT SURFACE TEMPERATURE.
AD-282 741 DIV. 25

APPLICATION OF HOOKE'S CYLINDRICAL COORDINATES TO THE DERIVATION OF THE GENERALIZED PLANE STRAIN SOLUTION TO A CLOSED SPIRALLOY TUBE SUBJECTED TO INTERNAL PRESSURE.
AD-282 734 DIV. 25

A STUDY WAS MADE OF ONE-DIMENSIONAL WAVE PROPAGATION IN AND ABOVE THE ELASTIC RANGE IN RODS OF ZnTi AL, 1018 STEEL, AND Cu. THE WAVES ARE THEORETICALLY DESCRIBED AS CONSISTING OF A FRONT OF DECREASING STEEPNESS FOLLOWED BY A ZONE OF INELASTIC SLIP. STRAIN GAGE MEASUREMENTS WERE USED TO VERIFY THEORY.
AD-282 808 DIV. 17

*ELASTICITY
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AD-281 788 DIV. 25

*ELASTOMERS

RHEOLOGICAL BEHAVIOR OF A POLYURETHANE RUBBER FILLED WITH GRANULAR KCL ANALYZED IN COMPRESSION AND UNDER CONDITIONS OF RELAXATION OF UNCONFIRMED COMPRESSION.
AD-282 134 DIV. 25

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AD-282 458 DIV. 14

*ELASTOMERS
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AD-282 467 DIV. 20

*ELECTRIC ARCS

DESCRIPTION OF A DIRECT-CURRENT, ARC-EXCITED PLASMA GENERATOR USING NITROGEN AS THE WORKING FLUID.
AD-282 890 DIV. 25

*ELECTRIC CABLES

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AD-282 513 DIV. 12

*ELECTRIC CONNECTORS

MANUFACTURING METHODS FOR AND PERFORMANCE DATA ON NEW TYPES OF ELECTRIC CONNECTORS.
AD-282 359 DIV. 8

A TWO-CONDUCTOR SHIELDED CABLE CONNECTOR FOR USE IN MISSILE FIRING CIRCUITS TESTING OF SAMPLE CONNECTORS. DEVELOPMENT OF A CABLE BRAID CLAMP.
AD-282 513 DIV. 12

MIL-C-26518(USAF) MINIATURE, RACK AND PANEL, 200 C AMBIENT TEMPERATURE, ELECTRICAL CONNECTORS.
AD-283 000 DIV. 7

*ELECTRIC CONNECTORS
CLEANING

CLEANLINESS REQUIREMENTS FOR INCREASING RELIABILITY OF LEAD WELDS FOR ELECTRONIC COMPONENTS.
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*ELECTRIC CURRENTS
LABORATORY EQUIPMENT

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*ELECTRIC DETONATORS
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*ELECTRIC DISCHARGES

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*ELECTRIC FIELDS

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*ELECTRIC POWER PRODUCTION

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AD-282 389 DIV. 7

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AD-282 505 DIV. 7

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AD-282 718 DIV. 7

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AD-282 878 DIV. 1

PROGRAM FOR COMPUTER CALCULATION OF FIRM POWER RATE FOR POWER SYSTEM PAYOUT.
AD-283 047 DIV. 32

*ELECTRIC POWER PRODUCTION
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AD-282 752 DIV. 27

*ELECTRIC PRIMERS

TESTS ON TYPE T2, AN EXPLOSIVE SWITCH FIRED BY A SPECIAL ELECTRIC PRIMER, INDICATE THAT THE POWER OF THE PRIMER AND THE ELECTRICAL RESISTANCE OF THE PRIMER RESIDUE SHOULD BE INCREASED.
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*ELECTRIC PROPULSION

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SPACECRAFT ELECTRIC GENERATING AND PROPULSION SYSTEM INTEGRATION.
AD-282 752 DIV. 27

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AD-283 944 DIV. 30

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AD-282 911 DIV. 16

***ESTERS**

GLYCIDIC ESTERS AND/OR ORGANIC DISULFIDES AND RELATED SUBSTANCES AS SOURCES OF ANTI-RADIATION DRUGS.
AD-282 000 DIV. 4

SYNTHESIS AND PURIFICATION METHODS FOR PARTIALLY FLUORINATED COMPOUNDS: 2D CARBOXYLIC ACID ESTERS, 2 CU SOAPS, 2 DICARBAMATES, 2 PARTIALLY FLUORINATED HYDROCARBONS AND 1 THIOETHER. SURFACTANTS, DIELECTRICS, ANTIOXIDANTS.
AD-282 034 DIV. 4

***ETHERS**

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AD-281 831 DIV. 14

SYNTHESIS AND PURIFICATION METHODS FOR PARTIALLY FLUORINATED COMPOUNDS: 2D CARBOXYLIC ACID ESTERS, 2 CU SOAPS, 2 DICARBAMATES, 2 PARTIALLY FLUORINATED HYDROCARBONS AND 1 THIOETHER. SURFACTANTS, DIELECTRICS, ANTIOXIDANTS.
AD-282 034 DIV. 4

***EVAPOTRANSPIRATION**

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AD-283 066 DIV. 25

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***EXHAUST GASES**
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BLAST AND FRAGMENT CHARACTERISTICS AROUND JET PERFORATOR X482.
AD-282 712 DIV. 22

***EXPLOSIVES**
**PENETRATION**

BLAST AND FRAGMENT CHARACTERISTICS AROUND JET PERFORATOR X482.
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***EXPLOSIVES**
**TNT**

DETONATION BEHAVIOR OF SOLID PROPELLANTS. MINIMUM PRESSURE FOR INITIATION OF DETONATION IN A DOUBLE-BASE PROPELLANT. DEPENDENCE OF WAVE TRAJECTORIES AND REACTION ZONE PROFILES UPON A GRAIN SURFACE IGNITION VERSUS A POINT IGNITION MODEL.
AD-281 713 DIV. 10

***EXTRATERRESTRIAL RADIO WAVES**

A METHOD FOR THE ANALYTICAL TREATMENT OF RADIO PHENOMENA IN THE TERRESTRIAL MAGNETOSPHERE.
AD-282 401 DIV. 2

THE DETECTION OR NON-DETECTION OF ENERGETIC SOLAR PROTONS IN THE VICINITY OF THE EARTH FOLLOWING LARGE SOLAR FLARES AND CONTINUUM TYPE IV RADIATION MAY BE DUE TO THE DIRECTION OF EMISSION OF THE PROTONS FROM THE SUN.
AD-282 964 DIV. 2

***EXTREMELY HIGH FREQUENCY**

THE INTERACTION OF A BUNCHED BEAM OF RELATIVISTIC ELECTRONS WITH SEVERAL DIFFERENT MICROWAVE CIRCUITS WAS ANALYZED IN CONNECTION WITH THE GENERATION OF SUB-MILLIMETER ELECTROMAGNETIC RADIATION.
AD-282 146 DIV. 8

***EXTREMELY LOW FREQUENCY**

EFFECTS OF IONIZATION ON ELECTROMAGNETIC PHENOMENA IN THE TERRESTRIAL SYSTEM UNDER CONDITIONS OF EXTREMELY LOW FREQUENCY.
AD-282 050 DIV. 2

***EXTRUSION**

HIGH ENERGY RATE EXTRUSION PROCESS APPLIED TO TITANIUM ALLOYS, STEEL, AND ALUMINUM. THE DYNAPAK MACHINE, AND FOR TEE CONFIGURATION EXTRUSIONS AND EXTRUSION OF VARIOUS METALS INTO STRUCTURAL SHAPES.
AD-282 250 DIV. 26

***EYE**

THE TRANSMISSION OF ULTRAVIOLET RADIATION DECREASES WITH THE AGE OF THE EYE; TRANSMISSION OF INFRARED RADIATION APPEARS TO BE INDEPENDENT OF THE AGE; AND THE MAXIMUM TOTAL TRANSMITTANCE OF THE WHOLE EYE, ABOUT 81 PERCENT, IS OBTAINED IN THE REGION FROM 400 TO 800 MILLIMICRONS.
AD-283 100 DIV. 16

***FACSIMILE RECORDING SYSTEMS**

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AD-281 918 DIV. 9

***FAILURE (MECHANICS)**

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AD-281 796 DIV. 27

***FATIGUE (MECHANICS)**

THE MATERIAL PARAMETERS INFLUENCING THE CREEP AND FATIGUE LIFE OF FILAMENT WOUND LAMINATES ARE INVESTIGATED.
AD-282 126 DIV. 14

***FATTY ACIDS**

EFFECT OF ESSENTIAL FATTY ACID DEFICIENCY ON RATS. CHEMICAL STRUCTURE AND PENETRATION RATES OF ALKYLAMINES. EXPOSURE OF NORMAL AND EFA-DEFICIENT SKIN TO COMMON SOLVENTS. ELECTRON MICROSCOPY.
AD-282 298 DIV. 16

***FEASIBILITY STUDIES**

A RESEARCH STUDY AND EXPERIMENTAL INVESTIGATION OF TECHNIQUES AND EQUIPMENT CHARACTERISTICS OF PATTERN RECOGNITION SYSTEMS FOR PRACTICAL APPLICATION TO GRAPHICAL DATA PROCESSING FOR MILITARY REQUIREMENTS.
AD-282 613 DIV. 30

***FEEDBACK**

A SOLUTION TO SPEECH FORMANT FREQUENCY MEASUREMENT IN REAL TIME IS PROPOSED. THE SYSTEM CONTAINS A CONTINUOUSLY TUNED, AUTOMATIC TRACKING FILTER SYSTEM WHICH LOCATES SPECTRAL MAXIMA OF SPEECH SIGNALS THROUGH AUTOMATIC FREQUENCY CONTROL TECHNIQUES.
AD-282 147 DIV. 8

AN ANALYTICAL DETERMINATION OF THE EXISTENCE OF OPTIMUM POINTS IN A CLASS OF NETWORKS INCLUDING CLOSED-LOOP FEEDBACK SYSTEMS AS WELL AS PASSIVE NETWORKS.
AD-282 413 DIV. 12

***FERRITES**

THREE ASPECTS OF FERRITE FILM STUDY: (1) CHEMICAL DEPOSITION TECHNIQUES; (2) EVALUATION OF MICROWAVE PROPERTIES; AND (3) DETERMINATION OF THE CRYSTALLOGRAPHIC STRUCTURE.
AD-282 519 DIV. 17

***FERRITES**
**MANUFACTURING METHODS**

FERRITE MATERIAL SUITABLE FOR OPERATION AT 250 KW PEAK POWER IN S-BAND PHASE SHIFTERS; PREPARATION PROCEDURES, TEST METHODS, AND PROPERTIES OF FERRITES.
AD-282 628 DIV. 8

***FERROMAGNETIC MATERIALS**

NO-PERMALLOY FILM PREPARATION BY ELECTROPHORETIC DEPOSITION.
AD-282 099 DIV. 17

FERRITE MATERIAL SUITABLE FOR OPERATION AT 250 KW PEAK POWER IN S-BAND PHASE SHIFTERS; PREPARATION PROCEDURES, TEST METHODS, AND PROPERTIES OF FERRITES.
AD-282 628 DIV. 8

PRESENT RESULTS OBTAINED ON A MICROWAVE LIMITER UTILIZING A NEW MICROWAVE STRUCTURE

PROPAGATION HAVE BEEN CALCULATED FOR VARIOUS GEOMAGNETIC LATITUDES AND VARIOUS VALUES OF SOLAR ZENITH ANGLE.
AD-282 737 DIV. 25

*ELECTROMAGNETIC WAVES
EXCITATION

THE CONDITIONS UNDER WHICH EXCITATION OF SURFACE WAVES ON A PERFECTLY CONDUCTING SCREEN COVERED WITH ANISOTROPIC PLASMA ARE EFFECTIVE.
AD-282 293 DIV. 25

*ELECTROMAGNETIC WAVES
HYDRODYNAMICS

AN EXPERIMENTAL STUDY OF THE PROPAGATION OF HYDROMAGNETIC WAVES IN A PLASMA BY MEANS OF A CIRCULAR CURRENT-CARRYING LOOP IMMERSED IN THE PLASMA. MAGNETIC PROBES WERE USED TO DETERMINE THE NATURE OF THE PROPAGATING MODE.
AD-282 899 DIV. 25

*ELECTROMAGNETIC WAVES
PROPAGATION

ANALYSIS OF THE PROPAGATION OF THE NORMAL REGION IN A SERIES WOUND SUPERCONDUCTING COIL WITHOUT PROTECTIVE CIRCUITRY.
AD-282 904 DIV. 25

*ELECTROMAGNETIC WAVES
SPECTROGRAPHIC ANALYSIS

SPECTROGRAPHIC AND PHOTOGRAPHIC ANALYSIS OF THE SCATTERING OF THE LASER BEAM BY HIGH DENSITY PLASMA DEMONSTRATE THE MOTION OF THE PLASMA.
AD-282 026 DIV. 25

*ELECTROMAGNETISM

FEASIBILITY STUDY OF SINGLE AND TWO-PHASE FREE-CONVECTION MHD AND EHD ENERGY CONVERSION.
AD-282 328 DIV. 25

*ELECTRON BEAMS

THE INTERACTION OF A BUNCHED BEAM OF RELATIVISTIC ELECTRONS WITH SEVERAL DIFFERENT MICROWAVE CIRCUITS WAS ANALYZED IN CONNECTION WITH THE GENERATION OF SUB-MILLIMETER ELECTROMAGNETIC RADIATION.
AD-282 146 DIV. 8

THE PRINCIPAL OBJECTIVES OF THIS PROGRAM ARE TO DEVELOP AND APPLY A GENERALIZED THEORY OF COUPLED MODES OF PROPAGATION TO THE STUDY OF INTERACTIONS IN DISTRIBUTED MICROWAVE DEVICES.
AD-282 978 DIV. 8

*ELECTRON DIFFRACTION ANALYSIS

THEORY OF THE 'EFFECTIVE CHARGE' AND THE VALUES OF INFORMATION TO BE GAINED. IMPORTANCE OF MOMENTUM TRANSFER DEPENDENCE.
AD-282 900 DIV. 20

*ELECTRON MULTIPLIERS

A METHOD OF SECONDARY-ELECTRON MULTIPLICATION, EMPLOYING AN ULTRAHIGH FREQUENCY OR A MICROWAVE ELECTRIC FIELD AND A SINGLE SECONDARY-EMITTING SURFACE.
AD-282 884 DIV. 20

*ELECTRON TRANSITIONS

THE PRACTICAL LIMITATIONS OF A GASEOUS QUANTUM COUNTER BASED ON THE STIMULATED EMISSIONS OF CERTAIN GASES.
AD-282 318 DIV. 20

*ELECTRON TUBES

CALIBRATION DATA EXPRESSING RELATION OF PARTIAL PRESSURE OF A GAS TO THE HIGH PEAKS AS DETERMINED BY VARYING THE RADIOFREQUENCY OF THE ELECTRIC FIELD.
AD-282 222 DIV. 25

A NEW PROGRAM TO STUDY DEFECTS IN SOLIDS BY ELECTRON-NUCLEAR DOUBLE RESONANCE TECHNIQUES AND A NEW METHOD OF LEVEL CROSSING SPECTROSCOPY IN WHICH BACKSCATTERED SIGNALS ARE UTILIZED, APPLIED TO ATOMIC COLLISION PHENOMENA IN RESONANCE STATES.
AD-282 410 DIV. 25

*ELECTRONIC CIRCUITS

VARACTOR MICROWAVE FREQUENCY MULTIPLIERS - VARACTOR HARMONIC GENERATORS AND CIRCUITS EMPLOYING REACTIVE NONLINEARITY. DESIGN PROCEDURES AND LABORATORY TECHNIQUES ARE PRESENTED TO ELIMINATE CHARACTERISTIC PROBLEMS IN THE ABOVE DEVICES.
AD-282 191 DIV. 8

FAILSAFE DIGITAL COMPUTER CIRCUITS.
AD-282 365 DIV. 8

*ELECTRONIC CIRCUITS
THERMIONIC EMISSION

CONTINUED RESEARCH ON HIGH TEMPERATURE, NUCLEAR RADIATION RESISTANT, INTEGRATED THERMIONIC CIRCUITRY OF HIGH EFFICIENCY AND LONG LIFE. CONTINUED INVESTIGATION OF TIMM TURES AND TRIODE GRIDS.
AD-282 396 DIV. 8

*ELECTRONIC CIRCUITS
THIN FILMS

FORMING OF ULTRA-THIN DIELECTRIC AND SEMICONDUCTING FILMS. ELECTRICAL PROPERTIES FOR MOLECULAR CIRCUIT DEVELOPMENT.
AD-282 722 DIV. 8

*ELECTRONIC COMMUTATORS

SILICON CONTROLLED RECTIFIER POWER INVERTER STUDY TO IMPROVE THE RELIABILITY, EFFICIENCY, FAULT-CORRECTION AND PROTECTION OF SILICON CONTROLLED RECTIFIER POWER CONVERTERS THROUGH A MORE POSITIVE COMMUTATION TECHNIQUE.
AD-282 985 DIV. 7

*ELECTRONIC EQUIPMENT

FEASIBILITY OF USING THE SUPERCONDUCTING PROPERTIES OF CERTAIN METALLIC THIN-FILM CONFIGURATIONS TO PERFORM ELECTRONIC FUNCTIONS, SUPERCONDUCTING TUNNELING ASSEMBLIES.
AD-282 310 DIV. 25

FABRICATION PROCESSES RECOMMENDED FOR MICROMODULES: ASSEMBLY, CLEANING, COATING, ENCAPSULATION, MARKING, AND TESTING.
AD-282 490 DIV. 8

AN APPLICATION OF A NON-PARAMETRIC TECHNIQUE FOR RELIABILITY COMPARISONS.
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*ELECTRONIC EQUIPMENT
CONTAMINATION

DELIBERATE CONTAMINATION OF ELECTRONIC COMPONENTS DURING MANUFACTURE IS PRESENTED AS A MEANS OF DEVELOPING STERILIZATION PROCEDURES FOR SPACECRAFT.
AD-282 800 DIV. 16

*ELECTRONIC EQUIPMENT
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*ELECTRONIC EQUIPMENT
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***GUIDED MISSILES (SURFACE-TO-AIR)**
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***HANDBOOKS**

RELIABILITY AND APPLICATION INFORMATION HANDBOOK ON TRANSISTORS USED IN MILITARY EQUIPMENT; SEQUENTIAL-ENVIRONMENT LIFE TESTS.
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**AIR FORCE PROCUREMENT**

CONTRACTUAL REQUIREMENTS, RECORDING, ANALYSIS, AND MANAGEMENT; A MANUAL FOR BUYING ACTIVITIES, ANALYSIS OF THE FLOW OF CONTROL PAPERWORK THROUGH AIR FORCE OFFICES IN THE PROCUREMENT OF R AND D GOODS AND SERVICES FROM PRIVATE CONTRACTORS, AUTOMATED MANAGEMENT CONTROL.
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**GAS TURBINES**

AIR-COOLED GAS TURBINE ROTORS; INLET TEMPERATURE; MATERIALS; HEAT EXCHANGE THEORY, BETWEEN GAS AND TURBINE PARTS, IN COOLING CHANNELS, ON LATERAL SURFACES, AND BY CONTACT OR FRICTION; TEMPERATURE OF COOLED DISCS AND IN WORKING AND GUIDE BLADES; AERODYNAMIC DESIGN.
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***HANDBOOKS**
**ORGANIC SOLVENTS**

A MEMO DEVELOPED TO ASSIST TECHNICAL PERSONNEL IN PERFORMING TASKS INVOLVING THE HANDLING OF ORGANIC SOLVENTS. TABLES GIVING THE PHYSICAL PROPERTIES AND TOXIC HAZARD RATINGS ARE INCLUDED.
AD-282 699 DIV. 4

***HARDENING**

RECENT EXPERIMENTS ON THE MECHANISMS INVOLVED IN STEEL STRENGTHENING PROVIDE BASIS FOR ELIMINATING SOME THEORIES AND DEVELOPING OTHERS.
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***HARDNESS**

CORRELATION OF TENSILE AND LONG TIME CREEP PROPERTIES TO HOT HARDNESS IS DESCRIBED FOR PH15-7MO-RH950 AND RENE' 41. THESE PROPERTIES WERE PLOTTED AGAINST A TIME TEMPERATURE PARAMETER AND THE RESULTS CROSS PLOTTED WITH VALUES OBTAINED SIMILARLY FOR HARDNESS.
AD-281 801 DIV. 17

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**SURGERY**

STUDIES ON PROFOUND HYPOTHERMIA. TECHNIQUE OF INDUCTION. METHOD INVOLVES USE OF PUMP OXYGENATOR. FOUND TO BE A SAFE METHOD OF CARDIOPULMONARY BYPASS.
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***HEAT RESISTANT ALLOYS**

FLEXURAL STRENGTH OF ZR-PYROGRAPHITE ALLOY-ON THE ORDER OF STEEL. NEW PRODUCTION TECHNIQUES. MICROSTRUCTURE.
AD-281 769 DIV. 17

PYROCARBIDE WITH EXCESS PYROGRAPHITE CONTINUES TO SHOW EXCEPTIONAL FLEXURAL STRENGTHS AT ROOM TEMPERATURE TO 1500 C.
AD-282 047 DIV. 14

ABSTRACTS OF REPORTS IN METALLURGY.
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A PROGRAM FOR THE OPTIMIZATION OF THE TA-8W-2HF ALLOY IS OUTLINED. MELTING AND PROCESSING OF 3-IN. DIAMETER ALLOY INGOTS TO SHEETS ARE DESCRIBED. PRELIMINARY ELEVATED AND LOW TEMPERATURE MECHANICAL PROPERTIES ARE GIVEN.
AD-282 896 DIV. 17

A NEW HARDENABLE HIGH-STRENGTH STAINLESS STEEL, STEEL AFC 77, WAS DEVELOPED. IT HAS HIGH STRENGTH (200,000 PSI TENSILE STRENGTH) AT THE AMBIENT TEMPERATURE AND RETAINS ITS STRENGTH WELL UP TO ABOUT 1200 F (120,000 PSI TENSILE STRENGTH AT 1200 F). IT HAS HIGHER STRENGTH, PARTICULARLY IN PROLONGED EXPOSURES, THAN ANY KNOWN STAINLESS STEEL.
AD-282 927 DIV. 17

***HEAT RESISTANT ALLOYS**
**HARDNESS**

CORRELATION OF TENSILE AND LONG TIME CREEP PROPERTIES TO HOT HARDNESS IS DESCRIBED FOR PH15-7MO-RH950 AND RENE' 41. THESE PROPERTIES WERE PLOTTED AGAINST A TIME TEMPERATURE PARAMETER AND THE RESULTS CROSS PLOTTED WITH VALUES OBTAINED SIMILARLY FOR HARDNESS.
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***HEAT RESISTANT ALLOYS**
**MACHINING**

MILLING, DRILLING, AND TAPPING STUDIES ON REFRACTORY METALS.
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***HEAT RESISTANT ALLOYS**
**MECHANICAL PROPERTIES**

PROPERTIES AND COMPOSITION OF MAR-AGING STEELS. A SERIES OF HIGH-NICKEL MARTENSITIC STEELS STRENGTHENED BY THE PRECIPITATION HARDENING MECHANISM. ULTRA-HIGH STRENGTH IS ACCOMPLISHED BY AGING THE STEELS WHEN IN A MARTENSITIC CONDITION.
AD-281 884 DIV. 17

***HEAT RESISTANT ALLOYS**
**TUNGSTEN ALLOYS**

BINARY W-BASE ALLOYS CONTAINING SMALL ADDITIONS OF NB, HF, OR ZR, AND TERNARY W-BASE ALLOYS CONTAINING ADDITIONS OF MO WITH HF OR ZR WERE CONSOLIDATED BY THE VACUUM-ARC-CASTING PROCESS. MACHINED BLANKS FROM EACH HEAT WERE EXTRUDED TO ROUND BILLET FORM BETWEEN 3000 AND 4200 F.
AD-281 738 DIV. 17

***HEAT RESISTANT POLYMERS**

SYNTHESIS OF REGULATED-STRUCTURE POLYPHENYL-ETHERSILOXANE ELASTOMERS INVOLVED AN ALCOHOLYSIS REACTION AND DIRECT CONDENSATION OF A DIHYDROXY PHENYLETHER DERIVATIVE WITH DICHLOROSILANES. THESE COPOLYMERS WERE CROSSLINKED, YIELDING MATERIALS WITH ELASTICITY BETWEEN 7 - 600 C.
AD-282 458 DIV. 14

***HEAT RESISTANT POLYMERS**
**ELASTOMERS**

SYNTHESIS OF ELASTOMERS CONTAINING SI-N BONDS IN THE MAIN CHAIN INCLUDING CHARACTERIZATION OF A SERIES OF NEW ORGANOSILAZANE MONOMERS.
AD-282 206 DIV. 14

***HEAT RESISTANT POLYMERS**
**SYNTHESIS**

REPORTS ON CONTINUING RESEARCH IN THE AREAS OF COMPUTER CODING, FERROMAGNETIC RESONANCE, HIGH TEMPERATURE POLYMERIZATION, NONAQUEOUS CHEMISTRY AND SEMICONDUCTOR PHYSICS.
AD-282 715 DIV. 25

***HEAT TRANSFER**

COLLECTION OF HEAT-TRANSFER PROPERTIES OF GASES AT MODERATE PRESSURES AND RULES FOR RAPID ESTIMATION OF MISSING DATA.
AD-281 901 DIV. 8

EXPERIMENTAL HEAT TRANSFER TO BLUNT AXISYMMETRIC BODIES NEAR THE LIMIT OF CONTINUUM FLOW.
AD-281 911 DIV. 9

FIRST ORDER SLIP EFFECTS ON THE PLANE COUETTE FLOW OF A DISSOCIATING GAS.
AD-281 948 DIV. 9

CONTINUING WORK ON LIQUID METAL BOILING HEAT TRANSFER, INCLUDES NUCLEATE POOL BOILING, FILM BOILING, BOILING IN AGRAVIC FIELDS, FORCED CIRCULATION, AND TWO PHASE FLOW.
AD-282 370 DIV. 25

BY APPLICATION TO THE BOLTZMANN EQUATION OF A NEW PERTURBATION METHOD WHICH ALLOWS PROPER TREATMENT OF LONG TIME OR PERSISTANT EFFECTS IT IS DESCRIBED BOTH THE TRANSIENT AND THE LONG-TIME BEHAVIOR OF A SIMPLE GAS AS IT RELAXES INTO THE CONTINUUM REGIME.
AD-282 604 DIV. 25

CHEMICAL RELAXATION ANALYSIS OF NONEQUILIBRIUM INVISCID FLOW BEHIND BLUNT BODIES.
AD-282 951 DIV. 9

THE EFFECT OF COMBUSTION CHAMBER GEOMETRY ON GAS FLOW IS INVESTIGATED BY MEANS OF A VORTEX-FLOW WATER MODEL STUDY.
AD-282 961 DIV. 27

THE EFFECT OF MICROWAVE HEATING ON THE ELECTRON DENSITY DISTRIBUTION AND PROPAGATION CHARACTERISTICS OF A SLIGHTLY IONIZED GAS FLOWING TRANSVERSE TO THE DIRECTION OF MICROWAVE PROPAGATION.
AD-282 993 DIV. 25

***GAS IONIZATION**

SPECTROGRAPHIC ANALYSIS OF POSITIVE ION EMISSION FROM ACTIVATED ATMOSPHERIC GASES AND A PROMISING METHOD OF ELEVATING THE WORK FUNCTION OF A SURFACE IONIZATION SOURCE.
AD-282 342 DIV. 25

FIVE THEORETICAL PLASMA STUDIES.
AD-282 894 DIV. 25

THE EFFECT OF MICROWAVE HEATING ON THE ELECTRON DENSITY DISTRIBUTION AND PROPAGATION CHARACTERISTICS OF A SLIGHTLY IONIZED GAS FLOWING TRANSVERSE TO THE DIRECTION OF MICROWAVE PROPAGATION.
AD-282 993 DIV. 25

***GAS IONIZATION**
**ELECTRICAL CONDUCTANCE**

THE UTILIZATION OF THE EFFECT OF A CONDUCTING MEDIUM ON THE IMPEDANCE OF A SMALL COIL FOR MEASUREMENT OF HIGH TEMPERATURE GAS CONDUCTIVITY WAS DEVELOPED AND ILLUSTRATED BY DATA OBTAINED FOR AIR IN THE RANGE 5-250 MHOS/METER AT ATM. DENSITY.
AD-281 876 DIV. 25

***GAS TURBINE ROTORS**
**AIR COOLED**

AIR-COOLED GAS TURBINE ROTORS: INLET TEMPERATURE; MATERIALS; HEAT EXCHANGE THEORY, BETWEEN GAS AND TURBINE PARTS; IN COOLING CHANNELS; ON LATERAL SURFACES; AND BY CONTACT OR FRICTION; TEMPERATURE OF COOLED DISCS AND IN WORKING AND GUIDE BLADES; AERODYNAMIC DESIGN.
AD-281 848 DIV. 27

***GASES**

THE CALCULATION OF COLLISION INTEGRALS IN THE MOMENT EQUATIONS IS TREATED.
AD-281 753 DIV. 25

COLLECTION OF HEAT-TRANSFER PROPERTIES OF GASES AT MODERATE PRESSURES AND RULES FOR RAPID ESTIMATION OF MISSING DATA.
AD-281 901 DIV. 8

THEORETICAL AND EXPERIMENTAL DEVELOPMENTS OF SOVIET GAS LASER RESEARCH AND IN THE GENERAL MASS FIELD.
AD-282 253 DIV. 25

THE PRACTICAL LIMITATIONS OF A GASEOUS QUANTUM COUNTER BASED ON THE STIMULATED EMISSIONS OF CERTAIN GASES.
AD-282 319 DIV. 20

A STUDY OF EQUILIBRIUM BETWEEN THERMIONIC EMISSION FROM SOLID AND SPACE CHARGES OF THE PHASES IN A GAS-SOLID SUSPENSION AT HIGH TEMPERATURES IS PRESENTED.
AD-282 604 DIV. 25

A HIGH INTENSITY MOLECULAR BEAM APPARATUS IS DESCRIBED WHICH IS BASED ON A SUPERSONIC STREAM GAS SOURCE.
AD-282 605 DIV. 25

BY APPLICATION TO THE BOLTZMANN EQUATION OF A NEW PERTURBATION METHOD WHICH ALLOWS PROPER TREATMENT OF LONG TIME OR PERSISTANT EFFECTS IT IS DESCRIBED BOTH THE TRANSIENT AND THE LONG-TIME BEHAVIOR OF A SIMPLE GAS AS IT RELAXES INTO THE CONTINUUM REGIME.
AD-282 604 DIV. 25

A HIGH INTENSITY MOLECULAR BEAM APPARATUS, BASED ON THE USE OF SUPERSONIC FLOW, WAS CONSTRUCTED.
AD-282 607 DIV. 25

***GASES**
**ELECTRICAL CONDUCTANCE**

THE UTILIZATION OF THE EFFECT OF A CONDUCTING MEDIUM ON THE IMPEDANCE OF A SMALL COIL FOR MEASUREMENT OF HIGH TEMPERATURE GAS CONDUCTIVITY WAS DEVELOPED AND ILLUSTRATED BY DATA OBTAINED FOR AIR IN THE RANGE 5-250 MHOS/METER AT ATM. DENSITY.
AD-281 876 DIV. 25

***GASES**
**HIGH TEMPERATURE RESEARCH**

THEORETICAL ANALYSIS AND TEST RESULTS OF A 200 ATMOSPHERE GAS DRIVER SYSTEM AND THE DEVELOPMENT OF A LIQUID DRIVER SYSTEM. RESEARCH ON PRESSURE ENERGY EXCHANGE PRINCIPLE TO DETERMINE FEASIBILITY FOR USING THIS TECHNIQUE TO PRODUCE ISOLATED HIGH TEMPERATURE AND HIGH PRESSURE GAS.
AD-282 277 DIV. 9

***GASES**
**TABLES**

TABLES OF THE FIRST 21 OF THE CHAPMAN-ENSKOG COLLISION INTEGRALS ARE PRESENTED ALONG WITH CERTAIN COMMONLY USED RATIOS. VALUES ARE TABULATED FOR 69 TEMPERATURES (REDUCED) AND FOR 7 VALUES OF THE FREE PARAMETER IN THE POTENTIAL.
AD-282 817 DIV. 25

***GELS**

ETCH MILLING BY LIQUID AND NON-LIQUID ETCHANTS ON STAINLESS STEEL PLATES AND HONEYCOMB CORES.
AD-282 920 DIV. 26

***GENERATORS**

THE DESIGN OF MICROWAVE BROADBAND EQUALIZERS CONSISTING OF CASCADED TRANSMISSION LINES TO WORK BETWEEN A RESISTIVE GENERATOR AND AN ARBITRARY LOAD.
AD-282 269 DIV. 9

VOLTAGE REGULATION AND POWER STABILITY IN UNCONVENTIONAL ELECTRICAL GENERATOR SYSTEMS. INTERNAL VOLTAGE CONTROL OF POWER SOURCES AND EXTERNAL VOLTAGE CONVERSION AND REGULATION.
AD-282 718 DIV. 7

***GENERATORS**
**MATERIALS**

MEASUREMENT OF THE CHANGE IN THERMAL DROP AND IN RESISTANCE OF THE CORE COATING WHILE BEING MATERIALS FOR EXTENDED PERIODS AT ELEVATED TEMPERATURES.
AD-282 509 DIV. 7

***GEODESICS**

THE STRENGTH OF GEOMETRIC SOLUTIONS FOR THE RELATIVE POSITIONS OF A SET OF BASE STATIONS USING SATELLITE OBSERVATIONS IS EXAMINED.
AD-282 760 DIV. 2

***GEODETIC DATA**

CORRECTIONS TO GRAVITY FORMULA FROM DIRECT OBSERVATIONS AND ANOMALIES EXPRESSED IN LOWER DEGREE SPHERICAL HARMONICS.
AD-282 378 DIV. 2

DEVELOPMENT OF GRAVITY BOUGUER ANOMALIES OF STATE OF OHIO AND THE ISOSTATIC ANOMALIES IN NORTH ATLANTIC IN FOURIER SERIES.
AD-282 546 DIV. 2

CORRELATION COEFFICIENTS AND THEIR USE IN THE PREDICTION OF MEAN GRAVITY ANOMALIES.
AD-282 956 DIV. 2

STUDIES ON THE ACCURACY OF THE COMPUTATION OF GRAVITY IN HIGH ELEVATIONS.
AD-282 957 DIV. 2

***GEOMETRY**

FOR PLANE SURFACES HELD TOGETHER BY BOLTS, CHAMFERED BOLT HOLES ON THE CONTACTING SURFACES PERMIT GREATER ABSORPTION OF SHOCK ENERGY BECAUSE OF LARGER SHEAR.
AD-282 104 DIV. 25

A STUDY IS PRESENTED WHICH CONCERNS THE INVESTIGATION OF THE RELATIONSHIP OF ELECTROMAGNETIC THEORY TO GEOMETRICAL OPTICS.
AD-282 481 DIV. 25

***GERMANIUM**

HOT CARRIER PHENOMENA IN SEMICONDUCTORS AT MICROWAVE FREQUENCIES IS DISCUSSED IN RELATION TO RECOMBINATIONS IN CU AND NI-DOPED GE. THE ELECTRON CAPTURE CROSS SECTION FOR NEUTRAL NI AND NEUTRAL CU DECREASED RAPIDLY WITH ELECTRON SPEED; FOR CU(-) WAS ESSENTIALLY INDEPENDENT OF SPEED.
AD-281 736 DIV. 25

DEFECT COMPLEXES AND LI PRECIPITATION IN GE

HERE INVESTIGATED BY STUDYING THE EFFECT OF OXYGEN, GAMMA RAY BOMBARDMENT, ANNEALING TEMPERATURE AND SOLUTE CONCENTRATION ON THE NUCLEATION OF LI PRECIPITATES.
AD-282 102 DIV. 25

ABSORPTION OVERLAYERS AND THEIR EFFECT ON THE SURFACE PROPERTIES OF PHOTOEMISSIVE MATERIALS.
AD-282 376 DIV. 25

***GLASS**

LENGTH EFFECT ON STRENGTH PROPERTIES OF GLASS FIBERS AND FAILURE DISTRIBUTION AT DIFFERENT STRENGTH LEVELS MEASURED BY TENSILE TESTS ON MONOFILAMENTS.
AD-282 982 DIV. 14

***GLASS SEALS**

APPLICATION OF POLYOPTIC SEALING TO HYDROGEN THYRATRON PRODUCTION TECHNIQUES. THE RELATIONSHIP BETWEEN SPHERICAL FIT AND VACUUM TIGHTNESS OF POLYOPTIC TUBES. LIFE TESTS.
AD-282 892 DIV. 8

***GLASS TEXTILES**

RELATIONSHIP BETWEEN THICKNESS AND MECHANICAL PROPERTIES OF SEVERAL GLASS-FABRIC-BASE PLASTIC LAMINATES.
AD-281 921 DIV. 14

THE MATERIAL PARAMETERS INFLUENCING THE CREEP AND FATIGUE LIFE OF FILAMENT WOUND LAMINATES ARE INVESTIGATED.
AD-282 126 DIV. 14

LENGTH EFFECT ON STRENGTH PROPERTIES OF GLASS FIBERS AND FAILURE DISTRIBUTION AT DIFFERENT STRENGTH LEVELS MEASURED BY TENSILE TESTS ON MONOFILAMENTS.
AD-282 982 DIV. 14

***GLASS TEXTILES**
**TENSILE PROPERTIES**

MECHANICAL PROPERTIES OF CONTINUOUS FILAMENT ROVING GLASS-COATED WITH EPOXY RESINS AT 75 AND 250 F.
AD-282 773 DIV. 14

***GLIDE PATH SYSTEMS**

CONTINUING RESEARCH ON AIRPORTS AND LANDING.
AD-283 060 DIV. 19

***GOLD**

QUENCH HARDENING IN GOLD AND PLATINUM.
AD-282 836 DIV. 25

***GOLD**
**HEAT TREATMENT**

DECREASE IN RESISTIVITY AS A FUNCTION OF TIME OF GOLD WIRES QUENCHED FROM ABOVE 900 C AND THEN ANNEALED NEAR ROOM TEMPERATURE IS OBSERVED TO BE AN S-SHAPED CURVE.
AD-283 095 DIV. 17

***GONIOMETERS**

ANALYSIS OF EFFECTS OF UPGRADE AND DOWNGRADE WALKING ON KNEE AND ANKLE ANGLES; 20 DEGREE INCLINE.
AD-282 962 DIV. 16

***GRAPHITE**

FLEXURAL STRENGTH OF ZR-PYROGRAPHITE ALLOY-ON THE ORDER OF STEEL. NEW PRODUCTION TECHNIQUES. MICROSTRUCTURE.
AD-281 760 DIV. 17

STUDY OF ROCKET FAILURE MECHANISMS AND THE DEVELOPMENT OF NOZZLE MATERIALS FOR SOLID PROPELLANT MOTORS. MATERIALS - GRAPHITE, ZRC, TH AND U OXIDES.
AD-281 794 DIV. 27

PLASTIC PROPERTIES OF CARBONS; FAMILIES OF CURVES OF THE DEPENDENCE OF YOUNG'S MODULUS IN TEMPERATURE AND ON HEAT TREATMENT FOR FOUR BASIC TYPES OF CARBON.
AD-282 006 DIV. 14

PYROCARBIDE WITH EXCESS PYROGRAPHITE CONTINUES TO SHOW EXCEPTIONAL FLEXURAL STRENGTHS AT ROOM TEMPERATURE TO 1500 C.
AD-282 047 DIV. 14

HIGH TEMPERATURE MECHANISMS OF CREEP AND RECOVERY IN GRAPHITE.
AD-282 236 DIV. 14

***GRAVITY**

CORRECTIONS TO GRAVITY FORMULA FROM DIRECT OBSERVATIONS AND ANOMALIES EXPRESSED IN LOWER

SOLUTION OF AN IDEALIZED PROBLEM INVOLVING THE TOWING OF A HYDROFOIL-STRUT SYSTEM IN A STILL FLUID.
AD-282 926 DIV. 9

*HYDROFORMING

THIN-WALL (0.060-IN.-THICK) CONVERGENT-DIVERGENT NOZZLE THROAT INSERTS WERE SUCCESSFULLY FABRICATED FROM 0.250-IN.-THICK UNALLOYED W PLATE BY A COMBINATION OF SHEAR AND CONVENTIONAL SPINNING.
AD-281 710 DIV. 27

*HYDROGEN

THERMODYNAMIC PROPERTIES OF THE SYSTEMS NB-H, V-H, AND TA-H DETERMINED USING THE EQUILIBRIUM PRESSURE METHOD TO MEASURE SOLUBILITY. H WAS FOUND MORE SOLUBLE IN NB THAN IN V OR TA.
AD-282 833 DIV. 4

THE EFFECTS OF DEGENERACY ON THE INELASTIC SCATTERING OF ELECTRONS AND PROTONS.
AD-282 812 DIV. 20

RELATIVE DIFFERENTIAL CROSS SECTIONS FOR THE PHOTOPRODUCTION OF 42.4 MEV POSITIVE PIONS FROM HYDROGEN MEASURED BETWEEN LABORATORY ANGLES OF 90 AND 170 DEGREES.
AD-283 022 DIV. 20

*HYDROGEN COMPOUNDS
AZIDES

IR STUDIES OF THE PHOTOLYSIS OF HN3 AND DN3 IN CO2 MATRICES AT 20 AND 53 K.
AD-282 779 DIV. 4

*HYPERFINE STRUCTURE

THE EFFECTS OF THE DISTRIBUTION OF NUCLEAR MAGNETIZATION ON HYPERFINE STRUCTURE (BOHR-WEISSKOPF EFFECT) ARE STUDIED IN THE CASE OF MUMESIC ATOMS.
AD-282 109 DIV. 20

*HYPERSONIC FLOW

TRANSVERSE HYPERSONIC FLOW VELOCITY EFFECTS ON LOW DENSITY DC ELECTRICAL DISCHARGES IN AIR.
AD-282 130 DIV. 9

STAGNATION POINT HEAT TRANSFER RATES OF CYLINDERS AND SPHERES IN HYPERSONIC LOW REYNOLDS NUMBER FLOWS.
AD-282 738 DIV. 9

CHEMICAL RELAXATION ANALYSIS OF NONEQUILIBRIUM INVISCID FLOW BEHIND BLUNT BODIES.
AD-282 901 DIV. 9

*HYPERSONIC FLOW
WAKE

AN EXPERIMENTAL INVESTIGATION WAS MADE OF THE FLOW FIELD BEHIND A TWO-DIMENSIONAL CIRCULAR CYLINDER AT A NOMINAL MACH NUMBER OF 5.7 AND THE TRANSITION FROM LAMINAR TO TURBULENT FLOW IN THE WAKE WAS DETERMINED AND CORRELATED WITH OTHER DATA.
AD-282 139 DIV. 25

*HYPERSONIC WIND TUNNELS
INSTRUMENTATION

TWO-COLOR PYROMETER FOR MEASUREMENT OF TEMPERATURE AND CONTAMINATION LEVEL IN HYPERSONIC WIND TUNNEL GAS FLOW.
AD-282 928 DIV. 30

*HYPERSONICS
MATHEMATICAL ANALYSIS

NEWTON-BUSEMANN PRESSURE LAW APPLIED TO SLENDER TWO-DIMENSIONAL BODY OF MINIMUM DRAG.
AD-282 127 DIV. 9

*HYPERVELOCITY PROJECTILES
TERMINAL BALLISTICS

TARGET PENETRATION PREDICTION BY HIGH SPEED AND ULTRA HIGH SPEED BALLISTIC IMPACT; STATISTICAL ANALYSIS OF PENETRATION DEPTH IN SEMI-INFINITE TARGETS.
AD-283 071 DIV. 22

*HYPOTHERMIA
MICE

EFFECT OF ACUTE AND CHRONIC LOW TEMPERATURE STRESS ON SURVIVAL OF MICE CHALLENGED WITH STAPHYLOCOCCUS AUREUS.
AD-281 747 DIV. 16

*HYPOTHERMIA
TEST METHODS

STUDIES ON PROFOUND HYPOTHERMIA. TECHNIQUE OF INDUCTION. METHOD INVOLVES USE OF PUMP OXYGENATOR. FOUND TO BE A SAFE METHOD OF CARDIOPULMONARY BYPASS.
AD-281 744 DIV. 16

*ICE

RELATIONSHIP BETWEEN FOUR GROUND PATTERNS, STRUCTURE OF THE ACTIVE LAYER, AND TYPE AND DISTRIBUTION OF ICE IN THE PERMAFROST.
AD-281 707 DIV. 2

MECHANISM FOR THE FORMATION OF INNER MORAINES FOUND NEAR THE EDGE OF COLD ICE CAPS.
AD-281 708 DIV. 2

RELATIVE INTENSITIES OF THE ELECTRON SPIN RESONANCE SPECTRA OF H AND D ATOMS OF MIXTURES OF H2O AND D2O IRRADIATED AT 4.2 K.
AD-282 727 DIV. 20

*ICE
NUCLEI

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AN ELASTICITY CAUSED BY DEBRIS DIPOLES IN PLASTICALLY STRAINED CRYSTALS AND THEIR EFFECT ON STRAIN HARDENING, DEFORMATION BAND FORMATION, STEADY-STATE CREEP AND PROBABLY FATIGUE AND OTHER FRACTURE PROCESSES.
AD-282 025 DIV. 17

FEASIBILITY OF USING THE SUPERCONDUCTING PROPERTIES OF CERTAIN METALLIC THIN-FILM CONFIGURATIONS TO PERFORM ELECTRONIC FUNCTIONS, SUPERCONDUCTING TUNNELING ASSEMBLIES.
AD-282 310 DIV. 25

ELECTRON SPECTRA OF TRANSITION METAL IONS IN CRYSTALS. COMPREHENSIVE FINAL REPORT.
AD-282 493 DIV. 25

***METALLIC CRYSTALS**
**CRYSTAL STRUCTURE**

CALCULATION OF STACKING FAULT ENERGIES FOR FACE-CENTERED CUBIC METALS.
AD-282 001 DIV. 17

***METALLIC CRYSTALS**
**ELECTRODES**

THE INFLUENCE OF THE CRYSTALLOGRAPHIC ORIENTATION OF ELECTRODE SURFACES ON HYDROGEN OVERVOLTAGE WAS INVESTIGATED. THE SINGLE AND POLYCRYSTALLINE ELECTRODES STUDIED INCLUDED AG, CU, CD, PT, SB, AU, SN, ZN, PB AND NI ELECTRODES.
AD-281 805 DIV. 7

***METALLIC SMOKE DEPOSITS**

PAPERS ON CHEMICAL VAPOR DEPOSITION INCLUDING POSSIBILITIES AND PROBLEMS OF CHEMICAL VAPOR DEPOSITION, GROWTH OF CRYSTALLINE FILMS, WHISKER GROWTH, VAPOR DEPOSITION OF DIFFUSION COATING, VAPOR-PHASE TRANSFER PROCESSES
AD-281 887 DIV. 25

***METALLIC SOAPS**

SYNTHESIS AND PURIFICATION METHODS FOR PARTIALLY FLUORINATED COMPOUNDS: 20 CARBOXYLIC ACID ESTERS, 2 CU SOAPS, 2 DICARBAMATES, 2 PARTIALLY FLUORINATED HYDROCARBONS AND 1 THIOETHER. SURFACTANTS, DIELECTRICS, ANTIOXIDANTS.
AD-282 034 DIV. 4

***METALORGANIC COMPOUNDS**

ANTIOXIDANTS FOUND PROMISING FOR IMPROVEMENT OF OXIDATIVE STABILITY AND LUBRICITY PROPERTIES OF POLYPHENYL ETHERS.
AD-281 831 DIV. 14

DEVELOPMENT OF IMPROVED TITANIUM ORGANIC COMPOUNDS FOR USE AS HYDRAULIC FLUIDS.
AD-282 710 DIV. 14

I. REACTIONS OF ORGANOMAGNESIUM COMPOUNDS WITH ALPHA, BETA-UNSATURATED KETONES; REACTIONS OF TRANS-4-PHENYL-3-BUTEN-2-ONE AND TRANS-3-PENTEN-2-ONE WITH DIMETHYL-, DIETHYL-, AND DIPHENYLMAGNESIUM WERE STUDIED. II. REACTIONS OF ORGANOMAGNESIUM COMPOUNDS WITH SATURATED KETONES KINETIC DATA WERE OBTAINED.
AD-283 008 DIV. 4

***METALORGANIC COMPOUNDS**
**SYNTHESIS**

SYNTHESIS OF RARE EARTH CHELATES, ORGANIC COMPOUNDS, AND METALORGANIC COMPOUNDS FOR LASER MOLECULES AND HOST MATERIALS.
AD-282 296 DIV. 4

***METALS**

EFFECTS OF STRESS GRADIENT AND STRESS BIAXIALITY ON THE NOTCH STRENGTH OF BRITTLE, SEMI-BRITTLE AND SEMI-DUCTILE MATERIALS. RESULTS ON A NEARLY IDEAL TI ALLOY WERE IN AGREEMENT WITH PREDICTIONS.
AD-281 811 DIV. 17

ABSTRACTS OF REPORTS IN METALLURGY.
AD-282 211 DIV. 17

TEMPERATURE DEPENDENCE OF REACTIONS WITH SPECIAL REFERENCE TO CREEP. KINETICS OF MULTI-STEP THERMALLY ACTIVATED REACTIONS ARE TREATED. THE CASE OF A STRESS-DEPENDENT REACTION INVOLVING STEPS WITH DIFFERENT STRESS FUNCTIONS IS DISCUSSED.
AD-282 806 DIV. 25

A STUDY WAS MADE OF ONE-DIMENSIONAL WAVE PROPAGATION IN AND ABOVE THE ELASTIC RANGE IN RODS OF 24ST AL, 1018 STEEL, AND CU. THE WAVES ARE THEORETICALLY DESCRIBED AS CONSISTING OF A FRONT OF DECREASING STEEPNESS FOLLOWED BY A ZONE OF INELASTIC SLIP. STRAIN GAGE MEASUREMENTS WERE USED TO VERIFY THEORY.
AD-282 808 DIV. 17

***METALS**
**CHEMICAL MILLING**

ETCH MILLING BY LIQUID AND NON-LIQUID ETCHANTS ON STAINLESS STEEL PLATES AND HONEYCOMB CORES.
AD-282 920 DIV. 26

***NAPHTHALENES**

FIRST ORDER DECAY OF TRIPLET STATES OF NAPHTHALENE, ANTHRACENE, PHENANTHRENE AND THEIR HALOGENATED DERIVATIVES WAS STUDIED IN VARIOUS ORGANIC SOLVENTS. THE DECAY RESULTS PARTLY FROM A BIMOLECULAR QUENCHING PROCESS AND PARTLY FROM A RADIATIONLESS CONVERSION TO GROUND STATE.
AD-281 776 DIV. 25

***NAVAL SUPPLIES**

USAGE AT BASE LEVEL OF AVIATION REPAIR PARTS AND COMPONENTS OF THE F4D-1 AIRCRAFT.
AD-282 422 DIV. 18

***NEGATIVE RESISTANCE CIRCUITS**

ELECTRICAL CHARACTERISTICS AND EFFECTS OF VARIATIONS IN PROCESSING CONDITIONS FOR NEGATIVE RESISTANCE ELEMENTS (NEGISTORS) FORMED IN POLYCRYSTALLINE CERAMIC MATRICES BY A CONTROLLED ELECTROPROCESSING TECHNIQUE.
AD-282 270 DIV. 9

***NERVOUS SYSTEM**

ATTEMPTS TO PRODUCE PROLONGED TREMOR AND RIGIDITY IN MONKEYS BY THE ADMINISTRATION OF DRUGS INDICATE FURTHER RESEARCH IS NECESSARY ON THE NEUROPHYSIOLOGY OF THE BASIC MOTOR FUNCTIONS.
AD-282 483 DIV. 16

***NEUTRON FLUX DENSITY**

NEUTRONS WERE DEFLECTEDD 90 DEGREES WITH A CARBON REFLECTOR ONTO SHIELD MATERIALS AND THE EMERGENT FLUX OF VARIOUS MONOENERGETIC CAPTURE GAMMA RAYS WERE EXPERIMENTALLY DETERMINED FOR SEVERAL THICKNESSES OF EACH MATERIAL.
AD-282 753 DIV. 20

***NEUTRON SPECTRUM**

EXPERIMENTAL VALUES FOR REACTION CROSS SECTIONS AT SEVERAL DIFFERENT NEUTRON ENERGY LEVELS ARE ADDED TO THOSE PRESENTLY AVAILABLE IN LITERATURE.
AD-281 938 DIV. 25

***NEUTRONS**

NUMERICAL SOLUTION OF THE TRANSPORT EQUATION FOR MONOENERGETIC NEUTRONS IN A MEDIUM WITH ISOTROPIC SCATTERING. TRUNCATION ERRORS.
AD-282 968 DIV. 20

***NICKEL ALLOYS**

CORRELATION OF TENSILE AND LONG TIME CREEP PROPERTIES TO HOT HARDNESS IS DESCRIBED FOR PH15-7MO-RH950 AND RENE' 41. THESE PROPERTIES WERE PLOTTED AGAINST A TIME TEMPERATURE PARAMETER AND THE RESULTS CROSS PLOTTED WITH VALUES OBTAINED SIMILARLY FOR HARDNESS.
AD-281 801 DIV. 17

PROPERTIES AND COMPOSITION OF MAR-AGING STEELS: A SERIES OF HIGH-NICKEL MARTENSITIC STEELS STRENGTHENED BY THE PRECIPITATION HARDENING MECHANISM. ULTRA-HIGH STRENGTH IS ACCOMPLISHED BY AGING THE STEELS WHEN IN A MARTENSITIC CONDITION.
AD-281 884 DIV. 17

***NIOBIUM**

OXIDATION BEHAVIOR OF TANTALUM AND TANTALUM BASE ALLOYS AT HIGH TEMPERATURES.
AD-281 882 DIV. 17

THERMODYNAMIC PROPERTIES OF THE SYSTEMS NB-H, V-H, AND TA-H DETERMINED USING THE EQUILIBRIUM PRESSURE METHOD TO MEASURE SOLUBILITY. H WAS FOUND MORE SOLUBLE IN NB THAN IN V OR TA.
AD-282 433 DIV. 4

***NIOBIUM ALLOYS**

OXIDATION BEHAVIOR OF TANTALUM AND TANTALUM BASE ALLOYS AT HIGH TEMPERATURES.
AD-281 882 DIV. 17

WELDING CHARACTERISTICS OF 3 COMMERCIAL COLUMBIUM BASE ALLOYS: FS82; D31; AND F48.
AD-282 228 DIV. 26

HIGH-TEMPERATURE OXIDATION PROTECTIVE COATINGS FOR VANADIUM-BASE ALLOYS.
AD-282 352 DIV. 17

***NITROGEN**

DESCRIPTION OF A DIRECT-CURRENT, ARC-EXCITED PLASMA GENERATOR USING NITROGEN AS THE WORKING FLUID.
AD-282 890 DIV. 25

***NITROGEN COMPOUNDS**

SYNTHESIS OF ELASTOMERS CONTAINING SI-N BONDS IN THE MAIN CHAIN INCLUDING CHARACTERIZATION OF A SERIES OF NEW ORGANOSILAZANE MONOMERS.
AD-282 206 DIV. 14

***NITROSO RADICALS**

THERMAL DIFFERENTIAL ANALYSIS OF CYANO-TRANSITION METAL COMPLEXES.
AD-282 399 DIV. 4

***NOISE**
**VERY LOW FREQUENCY**

TYPICAL ABSORPTION CURVES FOR MAGNETO-IONIC PROPAGATION HAVE BEEN CALCULATED FOR VARIOUS GEOMAGNETIC LATITUDES AND VARIOUS VALUES OF SOLAR ZENITH ANGLE.
AD-282 757 DIV. 25

***NOISE (RADAR)**
**REDUCTION**

DEVELOPMENT NOTES ON A FIXED-TUNED, BROADBAND, 4000-6000 MC AMPLIFIER, AND AN ELECTRONICALLY-TUNABLE, 4000-6000 MC AMPLIFIER.
AD-282 316 DIV. 8

***NOISE ANALYZERS**

STATISTICAL ESTIMATION THEORY IS APPLIED TO DERIVE EFFECTIVE TECHNIQUES FOR MEASUREMENT OF THE PULSE TRANSFER FUNCTION OF A LINEAR SYSTEM FROM NORMAL OPERATING RECORDS OBSCURED BY ADDITIVE NOISE.
AD-282 043 DIV. 25

***NOMOGRAPHS**

A SLIDE RULE FOR COMPLEX NUMBERS.
AD-282 912 DIV. 15

***NON-DESTRUCTIVE TESTING**

TELEVISION X-RAY ENLARGEMENT SYSTEM WITH A GAMMA AMPLIFIER IS DEVELOPED FOR NON-DESTRUCTIVE TESTING OF SOLID PROPELLANT MISSILE CASE WALLS AND WELDMENTS.
AD-282 225 DIV. 30

DEFECT FAILURE RELATIONSHIPS IN LARGE SOLID PROPELLANT MOTORS.
AD-282 430 DIV. 10

BIBLIOGRAPHY ON NON-DESTRUCTIVE TESTING OF ADHESIVE BONDED JOINTS.
AD-282 481 DIV. 14

***NON-LINEAR DIFFERENTIAL EQUATIONS**

A NEW APPROACH TO THE APPROXIMATE SOLUTION OF NONLINEAR DIFFERENTIAL EQUATIONS BY REWRITING THE EQUATION IN THE FORM OF AN INFINITE SEQUENCE OF LINEAR EQUATIONS USING THE CARLEMAN LINEARIZATION PROCESS.
AD-282 240 DIV. 19

***NONLINEAR SYSTEMS**

ANALYSIS AND SYNTHESIS OF NONLINEAR FILTERS AND PREDICTORS.
AD-282 663 DIV. 8

***NONLINEAR SYSTEMS**
**ANALYSIS**

TECHNIQUES FOR ANALYSIS OF NONLINEAR ATTITUDE CONTROL SYSTEMS FOR SPACE VEHICLES. VOLUME IV. REFERENCES AND BIBLIOGRAPHY.
AD-282 057 DIV. 12

***NOZZLES**

A HIGH INTENSITY MOLECULAR BEAM APPARATUS, BASED ON THE USE OF SUPERSONIC FLOW, WAS CONSTRUCTED.
AD-282 607 DIV. 25

***NUCLEAR EXPLOSIONS**

THE ELECTROMAGNETIC SIGNAL DUE TO THE EXCLUSION OF THE GEOMAGNETIC FIELD BY NUCLEAR EXPLOSIONS.
AD-281 771 DIV. 2

INSTRUMENTS FOR ANALYZING THE GROUND MOTION FROM NUCLEAR EXPLOSIONS.
AD-281 777 DIV. 2

DESCRIBES CONTINUING RESEARCH ON INSTRUMENTATION AND MEASUREMENT TECHNIQUES APPLYING THE TECHNIQUES OF METEOROLOGICAL RADAR DEVICES TO FALLOUT PREDICTION.
AD-282 023 DIV. 2

***NUCLEAR MAGNETIC MOMENTS**

THOMAS'S CLASSICAL THEORY OF SPIN IS TREATED. THE SPIN PRECESSION EQUATION IS GENERALIZED FOR VARIABLE ELECTROMAGNETIC FIELDS AND IN THE MORE GENERAL CASE OF A BILOCAL THEORY.
AD-282 098 DIV. 20

THE EFFECTS OF THE DISTRIBUTION OF NUCLEAR MAGNETIZATION ON HYPERFINE STRUCTURE (BOHR-WEISSKOPF EFFECT) ARE STUDIED IN THE CASE OF MUMESIC ATOMS.
AD-282 109 DIV. 20

***NUCLEAR MAGNETIC RESONANCE**

NUCLEAR MAGNETIC RESONANCE IN SPINNING SOLIDS AND METALS.
AD-282 396 DIV. 25

***NUCLEAR PHYSICS**

EQUATIONS FOR SINGLE PROPAGATORS OF SELF-COUPLED MESON FIELD. THEIR SOLUTION FOR A NUMERICAL MODEL, CONSIDERATIONS ON THE CONVERGENCE OF PERTURBATIVE EXPANSIONS.
AD-281 803 DIV. 20

***NUCLEAR POWER PLANTS**

THE FEASIBILITY OF USING AIR WELLS TO COOL UNDERSNOW STRUCTURES IN THE ARCTIC DURING THE SUMMER MONTHS.
AD-281 709 DIV. 13

THE FEASIBILITY IS INVESTIGATED OF THE NUCLEAR THERMIONIC RADIATOR SPACE POWER SYSTEM.
AD-282 179 DIV. 20

***NUCLEAR POWER PLANTS**
**AUXILIARY POWER PLANTS**

LINED-CAVITY EXPLOSIVE DESTRUCT CHARGE (SHAPED CHARGE) CONCEPT FOR AIRBORNE SMALL NUCLEAR AUXILIARY POWER (SNAP) REACTOR: LINEAR SHAPED CHARGE PENETRATION TESTS.
AD-282 977 DIV. 22

***NUCLEAR PROPULSION**

BIBLIOGRAPHY OF SOVIET DEVELOPMENT IN NUCLEAR INSTRUMENTATION AND CONTROL FOR PROPULSION.
AD-281 893 DIV. 21

***NUCLEAR SPINS**

THOMAS'S CLASSICAL THEORY OF SPIN IS TREATED. THE SPIN PRECESSION EQUATION IS GENERALIZED FOR VARIABLE ELECTROMAGNETIC FIELDS AND IN THE MORE GENERAL CASE OF A BILOCAL THEORY.
AD-282 098 DIV. 20

RELATIVE INTENSITIES OF THE ELECTRON SPIN RESONANCE SPECTRA OF H AND D ATOMS OF MIXTURES OF H2O AND D2O IRRADIATED AT 4.2 K.
AD-282 727 DIV. 20

***NUCLEAR STATES**

FIRST ORDER DECAY OF TRIPLET STATES OF NAPHTHALENE, ANTHRACENE, PHENANTHRENE AND THEIR HALOGENATED DERIVATIVES WAS STUDIED IN VARIOUS ORGANIC SOLVENTS. THE DECAY RESULTS PARTLY FROM A BIMOLECULAR QUENCHING PROCESS AND PARTLY FROM A RADIATIONLESS CONVERSION TO GROUND STATE.
AD-281 776 DIV. 25

***NUCLEATION**

NUCLEATION IN CONDENSATION FROM THE VAPOR PHASE ONTO A SUBSTRATE.
AD-282 159 DIV. 25

***NUCLEI**

THE RELATIVE ABUNDANCE OF NUCLEI HEAVIER THAN LITHIUM IN PRIMARY COSMIC RADIATION WAS INVESTIGATED USING PHOTOMETRIC MEASUREMENTS MADE ON 362 TRACKS OF HEAVY PRIMARY PARTICLES IN AN EMULSION STACK EXPOSED OVER TEXAS.
AD-282 243 DIV. 20

THEORY OF THE 'EFFECTIVE CHARGE' AND THE VALUES OF INFORMATION TO BE GAINED. IMPORTANCE OF MOMENTUM TRANSFER DEPENDENCE.
AD-282 500 DIV. 20

A DETAILED CALCULATION OF FORMULAS FOR CROSS SECTIONS FOR INELASTIC SCATTERING OF ELECTRONS FROM COMPLEX NUCLEI.
AD-282 619 DIV. 20

***NUMERICAL METHODS AND PROCEDURES**

TABLES ARE PRESENTED OF NORMAL AND LOG-NORMAL RANDOM DEVIATES.
AD-282 193 DIV. 15

TABLES ARE PRESENTED OF NORMAL AND LOG-NORMAL RANDOM DEVIATES.
AD-282 194 DIV. 15

A SLIDE RULE FOR COMPLEX NUMBERS.
AD-282 912 DIV. 15

NUMERICAL SOLUTION OF THE TRANSPORT EQUATION FOR MONOENERGETIC NEUTRONS IN A MEDIUM WITH ISOTROPIC SCATTERING. TRUNCATION ERRORS.
AD-282 968 DIV. 20

***MILITARY TRAINING**
**WOMEN**

EVALUATION OF EFFECTIVENESS OF THE ARMY CLASSIFICATION BATTERY TESTS AND APTITUDE AREA COMPOSITES. IDENTIFICATION OF PERSONALITY FACTORS LEADING TO ATTRITION DURING TRAINING AND TO UNDERACHIEVEMENT IN TRAINING OR JOB. IMPROVEMENT IN THE UTILIZATION OF WAC PERSONNEL.
AD-282 122 DIV. 23

***MINERAL OILS**

AN ATTEMPT WAS MADE TO REMOVE TRACE AMOUNTS OF WATER FROM MINERAL OIL BY REACTION WITH ORGANIC ADDITIVES. NO RELIABLE ADDITIVE WAS FOUND.
AD-282 237 DIV. 14

***MINIATURE ELECTRICAL EQUIPMENT**

MIL-C-26518(USAF) MINIATURE, RACK AND PANEL, 200 C AMBIENT TEMPERATURE, ELECTRICAL CONNECTORS.
AD-283 000 DIV. 7

***MINIATURE ELECTRON TUBES**

APPLICATION OF POLYOPTIC SEALING TO HYDROGEN THYRATRON PRODUCTION TECHNIQUES. THE RELATIONSHIP BETWEEN SPHERICAL FIT AND VACUUM TIGHTNESS OF POLYOPTIC TUBES. LIFE TESTS.
AD-282 892 DIV. 9

***MINIATURE ELECTRONIC EQUIPMENT**

MIL-C-26518(USAF) MINIATURE, RACK AND PANEL, 200 C AMBIENT TEMPERATURE, ELECTRICAL CONNECTORS.
AD-283 000 DIV. 7

***MODULATION**
**LIGHT**

ELECTROCHEMICAL LIGHT MODULATOR. LIGHT SHUTTER. PLATING CELL. PLATING CURRENT AND OPTICAL DENSITY CHANGES. FLASH SENSOR. PULSE DIFFERENTIATORS AND AMPLIFIERS. SILICON CONTROLLED RECTIFIERS. POWER SUPPLY. FLASH DETECTION AND DISCRIMINATION.
AD-283 118 DIV. 1

***MODULATORS**
**LIGHT**

ELECTROCHEMICAL LIGHT MODULATOR. LIGHT SHUTTER. PLATING CELL. PLATING CURRENT AND OPTICAL DENSITY CHANGES. FLASH SENSOR. PULSE DIFFERENTIATORS AND AMPLIFIERS. SILICON CONTROLLED RECTIFIERS. POWER SUPPLY. FLASH DETECTION AND DISCRIMINATION.
AD-283 118 DIV. 1

***MOLECTRONICS**

FORMING OF ULTRA-THIN DIELECTRIC AND SEMICONDUCTING FILMS. ELECTRICAL PROPERTIES FOR MOLECULAR CIRCUIT DEVELOPMENT.
AD-282 728 DIV. 8

***MOLECULAR BEAMS**

NUCLEATION IN CONDENSATION FROM THE VAPOR PHASE ONTO A SUBSTRATE.
AD-282 150 DIV. 25

A HIGH INTENSITY MOLECULAR BEAM APPARATUS IS DESCRIBED WHICH IS BASED ON A SUPERSONIC STREAM GAS SOURCE.
AD-282 608 DIV. 25

A HIGH INTENSITY MOLECULAR BEAM APPARATUS, BASED ON THE USE OF SUPERSONIC FLOW, WAS CONSTRUCTED.
AD-282 607 DIV. 25

***MOLECULAR ROTATION**

THE COMPLIANCE MATRIX AND MOLECULAR VIBRATIONS.
AD-283 120 DIV. 25

***MOLECULAR SPECTROSCOPY**

THE COMPLIANCE MATRIX AND MOLECULAR VIBRATIONS.
AD-283 120 DIV. 25

***MOLECULAR STRUCTURE**

THE CHEMICAL STRUCTURES OF STREPTOLIN AND OLIGOMYCIN ANTIBIOTIC SUBSTANCES ARE DETERMINED.
AD-282 231 DIV. 4

***MOLECULAR STRUCTURE**
**CATALYSIS**

EFFECT OF MOLECULAR STRUCTURE ON CATALYSIS AND MOLECULAR BINDING: PHOSPHONATES, CARBOXYLIC ACIDS, AND SARIN. SECOND ORDER RATE CONSTANTS OF HALF-SALTS.
AD-282 251 DIV. 4

***MOLECULES**

INORGANIC ADDUCT MOLECULES OF OXO-COMPOUNDS. CRYSTAL CHEMISTRY OF THE SOLVATES OF ASCL3, POCL3, SEOCL2, SOCL2, SO2CL2 AND THEIR DERIVATIVES. OXO INDICATES THOSE COMPOUNDS WHICH CONTAIN AT LEAST ONE O ATOM WHICH IS BONDED TO ONLY ONE OTHER ATOM.
AD-281 904 DIV. 4

***MOLYBDENUM**
**PRODUCTION**

A SINGLE, CAREFULLY-CONTROLLED SUBLIMATION OF MOCL5 YIELDED A HIGHLY PURIFIED PRODUCT. TO OBTAIN SUBSTANTIAL YIELDS OF MO METAL, IT WAS NECESSARY TO CARRY OUT H REDUCTION OF MOCL5 AT REDUCED PRESSURE. TUBULAR METAL DEPOSITS WERE CONSOLIDATED IN BULK FORM BY ELECTRON BEAM MELTING.
AD-282 732 DIV. 17

EVALUATION OF MOLYBDENUM METAL PRODUCED BY THE TIN REDUCTION OF MOLYBDENUM DISULPHIDE PROCESS.
AD-282 956 DIV. 17

***MOLYBDENUM ALLOYS**
**CHEMICAL PROPERTIES**

IMPROVED OXIDATION RESISTANCE OF MO BY ALLOYING WITH RARE EARTH AND OTHER SELECTED METALS. SELECTIVE OXIDATION AND FORMATION OF PROTECTIVE COATINGS OF THE OXIDES Y2O3 AND HFO2 BY INTERNAL OXIDATION.
AD-282 638 DIV. 17

***MONITORS**
**ANTISUBMARINE WARFARE**

DESIGN OF AUDIO CONTROL AND MONITOR PANELS FOR ASW FLIGHT TEST PURPOSES: ROUTING AND RECEIVING AUDIO INFORMATION FROM PROJECT RECEIVERS ON P2V-7 AIRCRAFT.
AD-282 869 DIV. 6

***MOON**

TEST METHODS TO SIMULATE LUNAR SURFACE FORMATIONS.
AD-283 002 DIV. 2

***MORPHINE**

MEASUREMENTS OF MECHANICAL MOBILITY PARAMETERS OF A SPECIAL PRESSURE BALANCED PIPE COUPLING ARE DESCRIBED AND INPUT MECHANICAL MOBILITY OF A FLANGED METAL PIPE AND WEIGHT STRUCTURE IS CALCULATED AND MEASURED.
AD-282 172 DIV. 25

***MOTION**
**MEASUREMENT**

ANALYSIS OF EFFECTS OF UPGRADE AND DOWNGRADE WALKING ON KNEE AND ANKLE ANGLES: 20 DEGREE INCLINE.
AD-282 962 DIV. 16

***MOTOR VEHICLE OPERATORS**

IMPROVEMENT OF PERFORMANCE IN ARMY MONITOR JOBS. A STUDY OF VIGILANCE UNDER FIELD CONDITIONS. PLANS FOR A VIGILANCE LABORATORY. OPERATIONAL HUMAN FACTORS PROBLEMS OF THE ARMY SECURITY AGENCY. DEVELOPMENT OF SELECTION TECHNIQUES FOR PERSONNEL IN MAN-MACHINE SYSTEMS.
AD-282 020 DIV. 23

***MULTIPLEX TRANSMISSION**

DESIGN STUDY FOR A VARIABLE-RATE, FULL-DUPLEX VOCODER SYSTEM.
AD-282 986 DIV. 30

4000-6000 MC AMPLIFIER; AND AN ELECTRONICALLY-TUNABLE, 4000-6000 MC AMPLIFIER.
AD-282 316 DIV. 9

***PARTIAL DIFFERENTIAL EQUATIONS**

MIXED PROBLEMS FOR HIGHER-ORDER HYPERBOLIC EQUATIONS WHEN THE OPERATORS POSSESS CONSTANT COEFFICIENTS AND WHEN THE UNDERLYING DOMAIN IS A QUARTER-SPACE OR A SEMI-INFINITE STRIP.
AD-282 429 DIV. 15

FINITE-DIFFERENCE METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS.
AD-282 452 DIV. 15

A STUDY IS PRESENTED WHICH CONCERNS THE INVESTIGATION OF THE RELATIONSHIP OF ELECTROMAGNETIC THEORY TO GEOMETRICAL OPTICS.
AD-282 481 DIV. 25

THE CALCULATION OF PARTICULAR SOLUTIONS OF LINEAR PARTIAL DIFFERENTIAL EQUATIONS BY THE METHOD OF INTEGRAL OPERATORS.
AD-282 611 DIV. 15

***PARTICLES**

A DETAILED CALCULATION OF FORMULAS FOR CROSS SECTIONS FOR INELASTIC SCATTERING OF ELECTRONS FROM COMPLEX NUCLEI.
AD-282 615 DIV. 20

***PASSENGER VEHICLES**

EVALUATION OF THE M116 AMPHIBIOUS CARGO CARRIER IN A TROPICAL JUNGLE ENVIRONMENT.
AD-282 626 DIV. 11

***PENICILLIN**

GLYCIDIC ESTERS AND/OR ORGANIC DISULFIDES AND RELATED SUBSTANCES AS SOURCES OF ANTI-RADIATION DRUGS.
AD-282 000 DIV. 6

***PENTABORANES**

THE MOST EFFECTIVE DECONTAMINANT WAS DEVELOPED FOR EACH OF THE FOLLOWING 4 TOXIC MISSILE PROPELLANTS: N2O4; CLF3; N2H4; UDMH; AND ASMD. DILUTE AQUEOUS SOLUTIONS OF AMMONIA APPEAR TO BE THE BEST COMMON DECONTAMINANT FOR THESE PROPELLANTS.
AD-281 818 DIV. 10

***PERIODICALS**

STATISTICAL ANALYSIS OF BIBLIOGRAPHIC SOURCES IN THE PHYSICAL REVIEW. DEFINITION OF THREE CLASSES OF PERIODIC LITERATURE IN SCIENCE. THE DEFINITIVE JOURNAL, A CLOSED LIST OF WIDELY USED JOURNALS, AND AN OPEN LIST OF RARELY USED JOURNALS. CONSIDERATIONS FOR A SCIENCE COMMUNICATION SYSTEM.
AD-282 697 DIV. 32

***PERISCOPES**
**DESIGN**

WIDE ANGLE PERISCOPE FOR AIRCRAFT COCKPITS.
AD-283 115 DIV. 1

***PERMAFROST**

RELATIONSHIP BETWEEN FOUR GROUND PATTERNS, STRUCTURE OF THE ACTIVE LAYER, AND TYPE AND DISTRIBUTION OF ICE IN THE PERMAFROST.
AD-281 707 DIV. 2

***PERSONALITY**

RELATION OF GROUP VARIABLES TO INDUCTION OF CHANGES IN INDIVIDUAL BEHAVIOR, PARTICULARLY AS THIS BEHAVIOR REPRESENTS GENERALIZED OR RELATIVELY PERMANENT CHANGE IN THE BEHAVIOR OF GROUP MEMBERS. A 10-CATEGORY SCHEMA OF THE CHANGE PROCESS.
AD-282 646 DIV. 28

***PERSONALITY**
**NEEDS**

THREE PERSONALITY ELEMENTS IN THE CAPACITY OF TECHNOLOGY FRESHMEN TO MEET CURRICULUM DEMANDS.
AD-282 531 DIV. 28

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AD-282 532 DIV. 28

***PERSONALITY**
**THEORY**

AN INQUIRY INTO THEORETICAL ATTEMPTS IN PSYCHOLOGY TO DENOTE SELF-CONCEPT.
AD-282 534 DIV. 28

***PERSONALITY TESTS**

RELATION OF EMPIRICAL PROVERBS TEST ITEMS TO THE THEORETICAL STRUCTURE FROM WHICH THEY ARE DERIVED. ERICKSON'S PSYCHO-SOCIAL DEVELOPMENTAL PHASES AND THE FREUDIAN SCHEME OF PSYCHO-SEXUAL DEVELOPMENT FOR RELATING TEST ITEMS.
AD-283 086 DIV. 28

IDENTIFICATION OF PERSONALITY AND CHARACTER DISORDERS IN WOMEN NAVAL RECRUITS USING PROVERBIAL ATTITUDES TEST WHICH DISCRIMINATES BETWEEN NORMAL SUBJECTS AND SUBJECTS WITH PERSONALITY AND CHARACTER DISORDERS.
AD-283 097 DIV. 28

***PERSONNEL**

EVALUATION OF PERSONNEL SELECTION SYSTEMS. CRITERIA FOR WORK SYSTEMS WHICH SELECTION SYSTEMS ARE DESIGNED TO SUPPORT. A THEORY OF INDUSTRIAL MOTIVATION. DEVELOPMENT OF INSTRUMENTS FOR ASSESSING THE MOTIVATION OF A POTENTIAL WORKER.
AD-282 796 DIV. 23

***PERTURBATION THEORY**

A CALCULATION FROM SINGLY-EXCITED STATES TO THE SECOND-ORDER PERTURBATION THEORY ENERGY OF AN N-ELECTRON ATOM OR ION.
AD-282 708 DIV. 25

THE DISTORTED WAVE APPROXIMATION FOR THE SOLUTION OF THE VIBRATIONAL ENERGY TRANSFER PROBLEM AS A CONTRIBUTION TO THE THEORY OF INELASTIC MOLECULAR COLLISIONS.
AD-282 861 DIV. 25

***PHASE MEASUREMENT**

A MATHEMATICAL PROCEDURE FOR SELECTING AN ACQUIRABLE CODE IS DESCRIBED.
AD-281 731 DIV. 6

***PHASE MODULATION**

RECOVERY OF INFORMATION CHANGED TO PHASE MODULATION IN IONOSPHERIC WAVE PATHS.
AD-282 960 DIV. 8

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**TEMPERATURE**

INDIUM FILMS OF 200 TO 5300 ANGSTROMS THICKNESS VACUUM DEPOSITED ON MICA SUBSTRATES CAN BE USED TO DETERMINE WHETHER A THERMAL BATTERY HAS BEEN ACCIDENTALLY ACTIVATED. PRIOR TO MELTING AT 156 C THE FILMS HAD LOW RESISTANCE; AFTER MELTING A HIGH RESISTANCE, 100,000 OHMS, WAS OBTAINED.
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TESTS ON TYPE T2, AN EXPLOSIVE SWITCH FIRED BY A SPECIAL ELECTRIC PRIMER, INDICATE THAT THE POWER OF THE PRIMER AND THE ELECTRICAL RESISTANCE OF THE PRIMER RESIDUE SHOULD BE INCREASED.
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***RADIOLOGICAL DOSAGE**

REPORT OF THE SECOND COMMITTEE ON THE PERMISSIBLE DOSAGE FOR INTERNAL RADIATION. A TRANSLATION FROM KERNENERGIE. ANALYSIS OF THE ELEMENTS OF THE ORGANS AND TISSUES OF THE HUMAN BODY. EXTENSIVE TABLES OF DOSAGES FOR EACH ORGAN OR TISSUE.
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GLYCIDIC ESTERS AND/OR ORGANIC DISULFIDES AND RELATED SUBSTANCES AS SOURCES OF ANTI-RADIATION DRUGS.
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GENERALIZATION OF TECHNIQUES COMMONLY EMPLOYED IN MAKING MICROWAVE IMPEDANCE CALCULATIONS TO FACILITATE THE CALCULATION INVOLVED IN THE ANALYSIS OF TRANSMISSION LINE NETWORKS.
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**ELECTRODES**

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*SEMICONDUCTING FILMS
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*SEMICONDUCTORS

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*SEMICONDUCTORS
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*SEMICONDUCTORS
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*SEMICONDUCTORS
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AD-281 718 DIV. 25

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*SEMICONDUCTORS
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THE CORRELATION BETWEEN THE DAY-TO-DAY DIRECTION OF THE WIND IS STUDIED BY MEANS OF A STOCHASTIC MODEL OF PERSISTENCE IN A CHAIN OF EVENTS.
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*SHAPED CHARGES

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*SHAPED CHARGES
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***SPACE FLIGHT SIMULATION**

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BIBLIOGRAPHY OF PROJECT APOLLO AND ORBITAL RENDEZVOUS AUGUST 1959 - DECEMBER 1961.
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BIBLIOGRAPHY OF 282 REFERENCES ON THE TECHNIQUE OF SPACE RENDEZVOUS, ORBITAL TRANSFER, AND OTHER ASPECTS OF SPACE NAVIGATION.
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***SPACESHIPS RANGE FINDING**

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AN APPROXIMATE SOLUTION OF THE EQUATION WHICH GOVERNS THE INVISCID MODES OF INSTABILITY OF STEADY FLOW BETWEEN CONCENTRIC ROTATING CYLINDERS IS DERIVED.
AD-282 126 DIV. 9

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ETCH MILLING BY LIQUID AND NON-LIQUID ETCHANTS ON STAINLESS STEEL PLATES AND HONEYCOMB CORES.
AD-282 920 DIV. 26

A NEW HARDENABLE HIGH-STRENGTH STAINLESS STEEL, STEEL AFC 77, WAS DEVELOPED. IT HAS HIGH STRENGTH (290,000 PSI TENSILE STRENGTH) AT THE AMBIENT TEMPERATURE AND RETAINS ITS STRENGTH WELL UP TO ABOUT 1200 F (120,000 PSI TENSILE STRENGTH AT 1200 F). IT HAS HIGHER STRENGTH, PARTICULARLY IN PROLONGED EXPOSURES, THAN ANY KNOWN STAINLESS STEEL.
AD-282 927 DIV. 17

***STAINLESS STEEL CORROSION**

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***STAINLESS STEEL HARDNESS**

CORRELATION OF TENSILE AND LONG TIME CREEP PROPERTIES TO HOT HARDNESS IS DESCRIBED FOR PH15-7MO-RH950 AND RENE' 41. THESE PROPERTIES WERE PLOTTED AGAINST A TIME TEMPERATURE PARAMETER AND THE RESULTS CROSS PLOTTED WITH VALUES OBTAINED SIMILARLY FOR HARDNESS.
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***STAINLESS STEEL HONEYCOMB CORES**

BRAZE ALLOY FOR BRAZING REPAIR PATCHES TO SANDWICH HONEYCOMB PANELS OF 17-7 PH STAINLESS STEEL BETWEEN 1000 AND 1300 F.
AD-283 058 DIV. 17

***STAINLESS STEEL MECHANICAL PROPERTIES**

PROPERTIES AND COMPOSITION OF MAR-AGING STEELS. A SERIES OF HIGH-NICKEL MARTENSITIC STEELS STRENGTHENED BY THE PRECIPITATION HARDENING MECHANISM. ULTRA-HIGH STRENGTH IS ACCOMPLISHED BY AGING THE STEELS WHEN IN A MARTENSITIC CONDITION.
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***STAPHYLOCOCCUS COUNTERMEASURES**

EFFECT OF ACUTE AND CHRONIC LOW TEMPERATURE STRESS ON SURVIVAL OF MICE CHALLENGED WITH STAPHYLOCOCCUS AUREUS.
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***SNOW**

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AD-281 709 DIV. 13

SNOW-COMPACTION EQUIPMENT SPRAYERS AND DUSTERS. EXPERIMENTS MADE TO DETERMINE THE FEASIBILITY OF ADDING FREE WATER TO COMPACTED SNOW TO IMPROVE ITS HARDNESS; TESTS TO DETERMINE THE EFFECTIVENESS OF SAWDUST AS AN INSULATOR TO PREVENT DETERIORATION.
AD-282 940 DIV. 13

***SNOW HARDENING**

TECHNIQUES AND EQUIPMENT FOR THE NAVY'S COLD-PROCESSING SNOW-COMPACTION PROCEDURES FOR PRODUCING LOAD-BEARING SNOW.
AD-281 946 DIV. 13

***SNOW ROADS**

TECHNIQUES AND EQUIPMENT FOR THE NAVY'S COLD-PROCESSING SNOW-COMPACTION PROCEDURES FOR PRODUCING LOAD-BEARING SNOW.
AD-281 946 DIV. 13

SNOW-COMPACTION EQUIPMENT SPRAYERS AND DUSTERS. EXPERIMENTS MADE TO DETERMINE THE FEASIBILITY OF ADDING FREE WATER TO COMPACTED SNOW TO IMPROVE ITS HARDNESS; TESTS TO DETERMINE THE EFFECTIVENESS OF SAWDUST AS AN INSULATOR TO PREVENT DETERIORATION.
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AD-282 832 DIV. 13

***SOILS MOISTURE**

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AD-282 133 DIV. 2

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AD-282 366 DIV. 2

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***SOLAR CELLS DESIGN**

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***SOLAR FLARES**

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***SOLENOIDS SUPERCONDUCTIVITY**

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AD-282 440 DIV. 10

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***SOLID ROCKET PROPELLANTS COMBUSTION**

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***SOLID ROCKET PROPELLANTS MECHANICAL PROPERTIES**

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***SOLID ROCKET PROPELLANTS PHYSICAL PROPERTIES**

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***SOLID ROCKET PROPELLANTS THEORY**

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A STUDY OF EQUILIBRIUM BETWEEN THERMIONIC EMISSION FROM SOLID AND SPACE CHARGES OF THE PHASES IN A GAS-SOLID SUSPENSION AT HIGH TEMPERATURES IS PRESENTED.
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THERMODYNAMIC PROPERTIES OF THE SYSTEMS NB-H, V-H, AND TA-H DETERMINED USING THE EQUILIBRIUM PRESSURE METHOD TO MEASURE SOLUBILITY. H WAS FOUND MORE SOLUBLE IN NB THAN IN V OR TA.
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***SONAR TARGETS**

STUDY OF UNDERWATER SOUND SCATTERERS BY COMBINED ACOUSTIC AND PHOTOGRAPHIC MEANS.
AD-282 991 DIV. 6

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***SUCTION SLOTS**

BIBLIOGRAPHY OF SOVIET DEVELOPMENT IN NUCLEAR INSTRUMENTATION AND CONTROL FOR PROPULSION.
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GLYCIDIC ESTERS AND/OR ORGANIC DISULFIDES AND RELATED SUBSTANCES AS SOURCES OF ANTI-RADIATION DRUGS.
AD-282 000 DIV. 4

A POLAROGRAPHIC METHOD WAS DEVELOPED FOR THE DETERMINATION OF MERCAPTANS IN THE PRESENCE OF DISULFIDES AND VICE VERSA. THIS METHOD DOES NOT DISTINGUISH BETWEEN SEPARATE MERCAPTANS, BUT YIELDS ONLY THE TOTAL MERCAPTAN AND DISULFIDE CONCENTRATION IN SOLUTION.
AD-282 857 DIV. 4

***SULFONATES**

GLYCIDIC ESTERS AND/OR ORGANIC DISULFIDES AND RELATED SUBSTANCES AS SOURCES OF ANTI-RADIATION DRUGS.
AD-282 000 DIV. 4

***SULFUR**

THE DISSOCIATION ENERGIES OF S2, SE2, TE2, AND DIATOMIC SULFUR DETERMINED BY A KNUDSEN-TORSION EFFUSION APPARATUS.
AD-282 436 DIV. 25

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A POLAROGRAPHIC METHOD WAS DEVELOPED FOR THE DETERMINATION OF MERCAPTANS IN THE PRESENCE OF DISULFIDES AND VICE VERSA. THIS METHOD DOES NOT DISTINGUISH BETWEEN SEPARATE MERCAPTANS, BUT YIELDS ONLY THE TOTAL MERCAPTAN AND DISULFIDE CONCENTRATION IN SOLUTION.
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**BIBLIOGRAPHY**

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AD-281 753 DIV. 25

A CRITERION FOR MAINTAINING THE CHEMICAL EQUILIBRIUM OF REACTING GAS MIXTURES IN EXPANSIVE FLOW.
AD-282 335 DIV. 9

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ANALYSIS OF THE PROPAGATION OF THE NORMAL REGION IN A SERIES WOUND SUPERCONDUCTING COIL WITHOUT PROTECTIVE CIRCUITRY.
AD-282 904 DIV. 25

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***SUPERSONIC DELAY LINES**

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AD-282 784 DIV. 8

***SUPERSONIC FLIGHT**

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AD-282 736 DIV. 4

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A HIGH INTENSITY MOLECULAR BEAM APPARATUS IS DESCRIBED WHICH IS BASED ON A SUPERSONIC STREAM GAS SOURCE.
AD-282 605 DIV. 25

A HIGH INTENSITY MOLECULAR BEAM APPARATUS, BASED ON THE USE OF SUPERSONIC FLOW, WAS CONSTRUCTED.
AD-282 607 DIV. 25

***SUPERSONIC WIND TUNNELS**

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AD-282 900 DIV. 30

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AD-281 948 DIV. 2

***SWITCHING CIRCUITS**

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AD-281 760 DIV. 30

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AD-282 348 DIV. 8

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AD-282 088 DIV. 9

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AD-283 029 DIV. 31

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AD-283 030 DIV. 31

SYMPOSIUM ON NAVAL HYDRODYNAMICS, SHIP PROPULSION AND HYDROELASTICITY.
AD-283 031 DIV. 31

***SYNTHESIS**

SYNTHESIS OF PYRIDINE-2-ALDOXIME-C-14 METHIODIDE WAS DESCRIBED. THE DISTRIBUTION OF IT AND ITS METABOLITES IN VARIOUS REGIONS OF THE BRAIN, BLOOD AND URINE, FOLLOWING IV INJECTION IN RATS WAS ALSO REPORTED. UNMETABOLIZED 2-PAM WAS SHOWN TO PASS THE BLOOD BRAIN BARRIER.
AD-282 747 DIV. 16

***SYNTHETIC RUBBER**

RHEOLOGICAL BEHAVIOR OF A POLYURETHANE RUBBER FILLED WITH GRANULAR KCL ANALYZED IN COMPRESSION AND UNDER CONDITIONS OF RELAXATION OF UNCONFINED COMPRESSION.
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***STATIC ELECTRICITY**

STATIC ELECTRICITY MEASUREMENTS OF ARMY HELICOPTERS.
AD-282 087 DIV. 1

***STATISTICAL ANALYSIS**

AN ANALYSIS PRESENTING SOME MODELS WHICH ARE SO GENERAL THAT THEIR APPLICATION VALIDITY IS USUALLY NOT DIFFICULT TO DECIDE UPON. THE LIMITING DISTRIBUTION OF THE NUMBER OF SUCCESSES FOR BINOMIAL EVENTS WITH SMALL PROBABILITIES FURNISHES THE BASIS FOR THE APPROXIMATE PROBABILITY DISTRIBUTIONS THAT ARE DEVELOPED.
AD-281 908 DIV. 15

THE THEORY OF RANK ORDER STATISTICS WITH APPLICATIONS OF LATTICE THEORY.
AD-281 934 DIV. 19

THE DESIGN IS DISCUSSED OF AN ELECTRICAL CALORIMETER FOR USE WITH WAVE SENSORS TO MEASURE THE AVERAGE ENERGY OF OCEAN WAVES.
AD-282 152 DIV. 30

THE STRENGTH OF GEOMETRIC SOLUTIONS FOR THE RELATIVE POSITIONS OF A SET OF BASE STATIONS USING SATELLITE OBSERVATIONS IS EXAMINED.
AD-282 780 DIV. 2

SPACIAL VARIATIONS OF VARIOUS METEOROLOGICAL PARAMETERS BETWEEN FOUR STATIONS IN TEXAS.
AD-283 021 DIV. 2

A PROCEDURE FOR DETERMINING CERTAIN LINEAR FUNCTIONALS OF TIME SERIES DATA AND AS A SPECIAL CASE THE PROBLEM OF ESTIMATING VELOCITY.
AD-283 037 DIV. 15

***STATISTICAL DISTRIBUTIONS**

THE ACCURATE COMPUTATION OF THE FIRST TWO INVERSE MOMENTS OF A POSITIVE HYPERGEOMETRIC VARIABLE.
AD-281 730 DIV. 19

AN ANALYSIS PRESENTING SOME MODELS WHICH ARE SO GENERAL THAT THEIR APPLICATION VALIDITY IS USUALLY NOT DIFFICULT TO DECIDE UPON. THE LIMITING DISTRIBUTION OF THE NUMBER OF SUCCESSES FOR BINOMIAL EVENTS WITH SMALL PROBABILITIES FURNISHES THE BASIS FOR THE APPROXIMATE PROBABILITY DISTRIBUTIONS THAT ARE DEVELOPED.
AD-281 908 DIV. 15

TABLES ARE PRESENTED OF NORMAL AND LOG-NORMAL RANDOM DEVIATES.
AD-282 198 DIV. 15

TABLES ARE PRESENTED OF NORMAL AND LOG-NORMAL RANDOM DEVIATES.
AD-282 196 DIV. 15

***STATISTICAL FUNCTIONS**

THE ACCURATE COMPUTATION OF THE FIRST TWO INVERSE MOMENTS OF A POSITIVE HYPERGEOMETRIC VARIABLE.
AD-281 730 DIV. 19

THE DETERMINATION OF IMPULSE RESPONSE OF A LINEAR SYSTEM BY THE USE OF CORRELATION TECHNIQUES AND DIRECT MEASUREMENT.
AD-281 770 DIV. 8

CORRELATION COEFFICIENTS AND THEIR USE IN THE PREDICTION OF MEAN GRAVITY ANOMALIES.
AD-282 956 DIV. 2

STUDIES ON THE ACCURACY OF THE COMPUTATION OF GRAVITY IN HIGH ELEVATIONS.
AD-282 957 DIV. 2

***STATISTICAL PROCESSES**

CONTRACTIONS AND THEIR QUADRATIC FORMS.
AD-282 941 DIV. 19

***STEEL**

STUDIES SHOWED THAT THE YIELD STRENGTH AND NOTCH TOUGHNESS OF 3 STEELS (HBMC #1, SUPER TRICENT, AISI 9262) IS A STRAIGHT LINE FUNCTION OF DEPTH OF SURFACE DECARBURIZATION; INCREASING DEPTH RESULTS IN INCREASING NOTCH TOUGHNESS AND DECREASING YIELD STRENGTH.
AD-281 718 DIV. 17

EFFECTS OF STRESS GRADIENT AND STRESS BIAXIALITY ON THE NOTCH STRENGTH OF BRITTLE, SEMI-BRITTLE AND SEMI-DUCTILE MATERIALS. RESULTS ON A NEARLY IDEAL TI ALLOY WERE IN AGREEMENT WITH PREDICTIONS.
AD-281 811 DIV. 17

RESULTS OF A STUDY OF THE SUSCEPTIBILITY OF VARIOUS HIGH STRENGTH MISSILE MATERIALS TO STRESS CORROSION CRACKING IN SYNTHETIC ENVIRONMENTS.
AD-281 881 DIV. 17

ABSTRACTS OF REPORTS IN METALLURGY.
AD-282 211 DIV. 17

A STUDY WAS MADE OF ONE-DIMENSIONAL WAVE PROPAGATION IN AND ABOVE THE ELASTIC RANGE IN RODS OF 24ST AL, 1018 STEEL, AND CU. THE WAVES ARE THEORETICALLY DESCRIBED AS CONSISTING OF A FRONT OF DECREASING STEEPNESS FOLLOWED BY A ZONE OF INELASTIC SLIP. STRAIN GAGE MEASUREMENTS WERE USED TO VERIFY THEORY.
AD-282 808 DIV. 17

TO INSURE THAT DROP WEIGHT TESTS CONDUCTED AT DIFFERENT LOCATIONS FOR THE NAVY WILL HAVE A COMMON MEANING, THE PROCEDURES HEREIN ARE TO BE USED WHENEVER DIRECTIONS, ORDERS OR SPECIFICATIONS STATE THAT STEELS ARE SUBJECT TO FRACTURE TOUGHNESS REQUIREMENTS AS DETERMINED BY DROP-WEIGHT TESTS.
AD-282 846 DIV. 17

A NEW HARDENABLE HIGH-STRENGTH STAINLESS STEEL, STEEL AFC 77, WAS DEVELOPED. IT HAS HIGH STRENGTH (290,000 PSI TENSILE STRENGTH) AT THE AMBIENT TEMPERATURE AND RETAINS ITS STRENGTH WELL UP TO ABOUT 1200 F (120,000 PSI TENSILE STRENGTH AT 1200 F). IT HAS HIGHER STRENGTH, PARTICULARLY IN PROLONGED EXPOSURES, THAN ANY KNOWN STAINLESS STEEL.
AD-282 927 DIV. 17

***STEEL**
**COOLING**

EXPERIMENTAL AND COMPUTATIONAL METHODS TO DETERMINE THE QUENCHING HEAT TRANSFER COEFFICIENT OF SILVER AND STEEL. RESULTS ARE REPORTED AS HEAT FLUX OR HEAT TRANSFER COEFFICIENT VS. SURFACE TEMPERATURE.
AD-281 854 DIV. 17

***STEEL**
**EXTRUSION**

IMPROVED PROCESSES FOR PRODUCING STEEL EXTRUSION TO TARGET CONFIGURATION AND TOLERANCE OF .240 + OR - .003 THICKNESS.
AD-281 943 DIV. 26

HIGH ENERGY RATE EXTRUSION PROCESS APPLIED TO TITANIUM ALLOYS, STEEL, AND ALUMINUM. THE DYNAPAK MACHINE, AND FOR TEE CONFIGURATION EXTRUSIONS AND EXTRUSION OF VARIOUS METALS INTO STRUCTURAL SHAPES.
AD-282 290 DIV. 26

***STEEL**
**FATIGUE (MECHANICS)**

FATIGUE CRACKS INDUCED IN HIGH STRENGTH STEEL PRODUCED LESS CONSISTENT CRACKING AT LOW TEMPERATURE (-200 F) THAN AT ROOM TEMPERATURE.
AD-282 470 DIV. 17

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*TETROXIDES

THE MOST EFFECTIVE DECONTAMINANT WAS DEVELOPED FOR EACH OF THE FOLLOWING 5 TOXIC MISSILE PROPELLANTS: N2O4, CLF3, N2H4, UDM, AND B5H9. DILUTE AQUEOUS SOLUTIONS OF AMMONIA APPEAR TO BE THE BEST COMMON DECONTAMINANT FOR THESE PROPELLANTS.
AD-281 918 DIV. 10

UNIT.
AD-282 710 DIV. 7

*TRANSPARENT PANELS

HIGH TEMPERATURE CAST-IN-PLACE TRANSPARENT PLASTIC LAMINATES FOUND FEASIBLE FOR CANOPIES ON SUPERSONIC FIGHTER AIRCRAFT. THERMAL AND PRESSURE TESTS OF FULL SCALE CANOPIES WITH AS-CAST MIL-P-8184 ACRYLIC AS THE OUTBOARD THERMAL BARRIER FACE SHEET.
AD-282 230 DIV. 1

*TRANSPORT PLANES

CONTROL DATA INVESTIGATION FOR OPTIMIZATION OF FUEL ON SUPERSONIC TRANSPORTS.
AD-282 420 DIV. 1

*TRANSPORT PROPERTIES

MAGNETIC FIELD DEPENDENCES OF ELECTRICAL AND THERMAL RESISTANCES IN LIQUID HELIUM TEMPERATURES INVESTIGATED FOR A SINGLE CRYSTAL OF ZINC.
AD-282 782 DIV. 25

INVESTIGATION OF TECHNIQUES WHEREBY ELECTRONS ARE MOVED OVER SIGNIFICANT DISTANCES BY UTILIZING NONLINEAR PROCESSES IN THE INTERACTION OF ELECTRONS AND RADIATION.
AD-282 916 DIV. 25

NUMERICAL SOLUTION OF THE TRANSPORT EQUATION FOR MONOENERGETIC NEUTRONS IN A MEDIUM WITH ISOTROPIC SCATTERING. TRUNCATION ERRORS.
AD-282 968 DIV. 20

*TRANSPORTATION

THE STRUCTURE, GEOMETRY, MESH, PATTERN, OR LAYOUT OF TRANSPORTATION NETWORKS.
AD-282 117 DIV. 33

*TRAVELING WAVE ELECTRON ACCELERATORS

THE INTERACTION OF A BUNCHED BEAM OF RELATIVISTIC ELECTRONS WITH SEVERAL DIFFERENT MICROWAVE CIRCUITS WAS ANALYZED IN CONNECTION WITH THE GENERATION OF SUB-MILLIMETER ELECTROMAGNETIC RADIATION.
AD-282 146 DIV. 8

*TRAVELING WAVE TUBES

PROBLEM AREAS IN THE DEVELOPMENT OF A S-BAND LOW NOISE PERIODIC PERMANENT MAGNET TRAVELING-WAVE TUBE.
AD-282 624 DIV. 8

*TRAVELING WAVE TUBES
VERY HIGH FREQUENCY

HIGH POWER CRESTATRONS FOR THE 100-300 MC FREQUENCY RANGE.
AD-282 696 DIV. 8

*TRIAZINES

SYNTHESIS, PURIFICATION AND SINGLE CRYSTAL GROWTH OF CORONENE, PERYLENE/IODINE COMPLEX AND CHLORANIL/DURENEDIAMINE COMPLEX. PREPARATION OF POLYMER OF 2,4,6-TRICYANO-S-TRIAZINE.
AD-281 892 DIV. 4

*TRIODES

HIGH PURITY TANTALUM BEING ELECTRICALLY STABLE, USED FOR DIODES AND TRIODES, MADE FROM TANTALUM, TANTALUM OXIDE, SILICON, COPPER, ALUMINUM, AND GOLD, FOR TUNNEL EMISSION AMPLIFIERS.
AD-282 412 DIV. 8

*TUMORS
CLIMATIC FACTORS

THE INFLUENCE OF LOW AMBIENT TEMPERATURE ON COLD ACCLIMATIZED MICE CHALLENGED WITH EHRLICH ASCITES TUMOR CELLS.
AD-281 743 DIV. 18

*TUNED AMPLIFIERS

DEVELOPMENT NOTES ON A FIXED-TUNED, BROADBAND, 4000-6000 MC AMPLIFIER, AND AN ELECTRONICALLY-TUNABLE, 4000-6000 MC AMPLIFIER.
AD-282 316 DIV. 8

*TUNGSTEN

CU AND CU-NI ALLOYS AS MATRIX MATERIALS FOR W-W BONDING OF FIBERS IN W FELTS. EXPERIMENTS WITH DIFFERENT DIAMETER W FIBERS INDICATE THAT A CERTAIN NI-TO-CU RATIO IS OPTIMUM FOR MAXIMUM STRENGTH OF THE COMPOSITE.
AD-282 738 DIV. 17

*TUNGSTEN
HYDROFORMING

TWIN-WALL (0.060-IN.-THICK) CONVERGENT-DIVERGENT NOZZLE THROAT INSERTS WERE SUCCESSFULLY FABRICATED FROM 0.250-IN.-THICK UNALLOYED W PLATE BY A COMBINATION OF SHEAR AND CONVENTIONAL SPINNING.
AD-281 710 DIV. 27

*TUNGSTEN ALLOYS
EXTRUSION

EXTRUSION OF AS-CAST W-3MO ALLOY.
AD-282 813 DIV. 26

*TUNGSTEN ALLOYS
MECHANICAL PROPERTIES

TUNGSTEN-BASE ALLOYS WERE PRODUCED BY HYDROSTATIC PRESSING OF POWDERED NI, FE, AND W. SHEETS WERE SINTERED, WARM ROLLED, AND ZONE REFINED. AN ELECTRON BEAM FURNACE WAS USED.
AD-282 120 DIV. 17

*TUNGSTEN ALLOYS
PROCESSING

BINARY W-BASE ALLOYS CONTAINING SMALL ADDITIONS OF NB, HF, OR ZR, AND TERNARY W-BASE ALLOYS CONTAINING ADDITIONS OF MO WITH HF OR ZR WERE CONSOLIDATED BY THE VACUUM-ARC-CASTING PROCESS. MACHINED BLANKS FROM EACH HEAT WERE EXTRUDED TO ROUND BILLET FORM BETWEEN 3000 AND 4260 F.
AD-281 728 DIV. 17

CU AND CU-NI ALLOYS AS MATRIX MATERIALS FOR W-W BONDING OF FIBERS IN W FELTS. EXPERIMENTS WITH DIFFERENT DIAMETER W FIBERS INDICATE THAT A CERTAIN NI-TO-CU RATIO IS OPTIMUM FOR MAXIMUM STRENGTH OF THE COMPOSITE.
AD-282 738 DIV. 17

*TURBINE WHEELS

TEMPERATURE MEASUREMENT OF J-33 TURBINE WHEELS AT VARIOUS POWER SETTINGS AND ALTITUDES WHILE TOWING TARGETS WITH A T-33 AIRPLANE.
AD-282 617 DIV. 27

*TURBOJET ENGINES
CORROSION

EFFECTS OF SULFUR AND SEA WATER ON DURABILITY OF JET ENGINES AND ON THE THERMAL STABILITY OF A TYPICAL JP-5 FUEL. COMBUSTOR FLAME RADIATION AND METAL TEMPERATURE DATA FROM 2-IN. COMBUSTOR TESTS.
AD-282 793 DIV. 27

*TURBOJET ENGINES
FLIGHT TESTING

TEMPERATURE MEASUREMENT OF J-33 TURBINE WHEELS AT VARIOUS POWER SETTINGS AND ALTITUDES WHILE TOWING TARGETS WITH A T-33 AIRPLANE.
AD-282 617 DIV. 27

*TURBULENT FLOW
AERODYNAMICS

ACOUSTIC IMPLICATIONS OF TURBULENCE AS IT AFFECTS FLIGHT CONDITIONS AND AERODYNAMIC FACTORS.
AD-281 703 DIV. 1

*ULTRASONIC RADIATION

ULTRASONIC DIFFRACTION, INTERNAL CONICAL REFRACTION, AND ATTENUATION IN NACL AND OTHER MATERIALS BY THE PULSE-ECHO METHOD.
AD-282 963 DIV. 25

*ULTRASONICS

THE PRESSURE DERIVATIVES OF THE ELASTIC STIFFNESS CONSTANTS OF CADMIUM WERE MEASURED BY THE ULTRASONIC PULSE ECHO TECHNIQUE.
AD-282 132 DIV. 25

ULTRASONIC RELAXATION IN ELECTROLYTIC SOLUTIONS IS REVIEWED WITH PARTICULAR REFERENCE TO SOLUTIONS OF ELECTROLYTES. A BRIEF SURVEY OF EXPERIMENTAL METHODS FOR MEASURING ULTRASONIC ABSORPTION IS GIVEN.
AD-282 814 DIV. 4

*ULTRASONICS
DATA TRANSMISSION SYSTEMS

DESIGN OF A RF TO OPTISONIC BOLOMETER TO MEASURE TEMPERATURE OF BRIDGE WIRES IN ELECTRO-EXPLOSIVE DEVICES PRIOR TO AND AT THE TIME OF DETONATION TO ELIMINATE PROBLEMS OF ELECTROMAGNETIC HAZARDS TO ORDNANCE WEAPONS.
AD-281 915 DIV. 6

*ULTRAVIOLET COMMUNICATION SYSTEMS
SPACE FLIGHT

USE OF THE ULTRAVIOLET SPECTRAL REGION BELOW 2800 ANGSTROMS FOR PASSIVE SPACE-TO-SPACE SURVEILLANCE AND FOR ACTIVE SECURE MESSAGE TRANSMISSION BETWEEN FRIENDLY SPACECRAFT.
AD-281 910 DIV. 6

*ULTRAVIOLET DETECTORS
SPACESHIPS

USE OF THE ULTRAVIOLET SPECTRAL REGION BELOW 2800 ANGSTROMS FOR PASSIVE SPACE-TO-SPACE SURVEILLANCE AND FOR ACTIVE SECURE MESSAGE TRANSMISSION BETWEEN FRIENDLY SPACECRAFT.
AD-281 910 DIV. 6

*ULTRAVIOLET RADIATION
WAVE TRANSMISSION

USE OF THE ULTRAVIOLET SPECTRAL REGION BELOW 2800 ANGSTROMS FOR PASSIVE SPACE-TO-SPACE SURVEILLANCE AND FOR ACTIVE SECURE MESSAGE TRANSMISSION BETWEEN FRIENDLY SPACECRAFT.
AD-281 910 DIV. 6

*ULTRAVIOLET RESEARCH

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AD-281 910 DIV. 6

APPLIED RESEARCH IN DEVELOPMENT OF AN ULTRAVIOLET LASER; GADOLINIUM-DOPED CALCIUM FLUORIDE CRYSTALS AND GADOLINIUM LIQUIDS; FLASH TUBES TO DRIVE GADOLINIUM.
AD-282 796 DIV. 25

*ULTRAVIOLET SPECTROSCOPY

APPLIED RESEARCH IN DEVELOPMENT OF AN ULTRAVIOLET LASER; GADOLINIUM-DOPED CALCIUM FLUORIDE CRYSTALS AND GADOLINIUM LIQUIDS; FLASH TUBES TO DRIVE GADOLINIUM.
AD-282 796 DIV. 25

*UNDERGROUND EXPLOSIONS

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AD-282 684 DIV. 30

*UNDERGROUND STRUCTURES

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AD-281 709 DIV. 13

*UNDERWATER EQUIPMENT
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AD-281 981 DIV. 30

*UNDERWATER EXPLOSIONS

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AD-281 826 DIV. 30

*UNDERWATER EXPLOSIONS
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SONAR EQUATION VALID FOR BOTH TRANSIENT AND LONG-PULSE SONARS; SOURCE LEVEL FOR COMPARING EXPLOSIVE AND PULSED SONARS; PREDICTION EXPRESSIONS FOR REVERBERATION AND DETECTION THRESHOLD; DETERMINATION OF BACK-SCATTERING COEFFICIENT OF DEEP SEA BED USING EXPLOSIVE SOUND SOURCES.
AD-282 183 DIV. 6

*UNDERWATER PROPULSION
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AD-283 090 DIV. 27

*UNDERWATER SOUND

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*URETHANES

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*TITANIUM ALLOYS
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*TITANIUM ALLOYS
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*TITANIUM CASTINGS
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*TITANIUM COMPOUNDS
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*TRANSMISSIONS

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WELDING OF NONFERROUS ALLOYS, RARE METALS, AND PLASTICS. SPOT WELDING, ELECTRIC ARC WELDING, AND USE OF ULTRASONICS.
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WELDING CHARACTERISTICS OF 3 COMMERCIAL COLUMBIUM BASE ALLOYS, FS82, D31, AND F48.
AD-282 225 DIV. 26

***WET CELLS**

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AD-282 163 DIV. 8

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***WIRE WINDING MACHINES**

A TRACTOR-TYPE WINCHING MACHINE FOR HANDLING FAIRED TOWLINES CONNECTING PULSES SEVERAL TIMES THE DIAMETER OF THE BASIC CABLE.
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***WOMEN**

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AD-281 718 DIV. 25

THEORETICAL AND EXPERIMENTAL DEVELOPMENTS OF SOVIET GAS LASER RESEARCH AND IN THE GENERAL MASS FIELD.
AD-282 253 DIV. 25

***ZINC COMPOUNDS**
**WAVEGUIDES**

REPORTS ON CONTINUING RESEARCH IN THE AREAS OF COMPUTER CODING, FERROMAGNETIC RESONANCE, HIGH TEMPERATURE POLYMERIZATION, NONAQUEOUS CHEMISTRY AND SEMICONDUCTOR PHYSICS.
AD-282 719 DIV. 25

***ZIRCONIUM ALLOYS**

FLEXURAL STRENGTH OF ZR-PYROGRAPHITE ALLOY-ON THE ORDER OF STEEL. NEW PRODUCTION TECHNIQUES. MICROSTRUCTURE.
AD-281 760 DIV. 17

PYROCARBIDE WITH EXCESS PYROGRAPHITE CONTINUES TO SHOW EXCEPTIONAL FLEXURAL STRENGTHS AT ROOM TEMPERATURE TO 1900 C.
AD-282 047 DIV. 14

***ZONE MELTING**

TUNGSTEN-BASE ALLOYS WERE PRODUCED BY HYDROSTATIC PRESSING OF POWDERED NI, FE, AND B. SHEETS WERE SINTERED, WARM ROLLED, AND ZONE REFINED. AN ELECTRON BEAM FURNACE WAS USED.
AD-282 180 DIV. 17

FILLED WITH GRANULAR KCL ANALYZED IN COMPRESSION AND UNDER CONDITIONS OF RELAXATION OF UNCONFIRMED COMPRESSION.
AD-283 134 DIV. 25

*USSR

BIBLIOGRAPHY OF SOVIET DEVELOPMENT IN NUCLEAR INSTRUMENTATION AND CONTROL FOR PROPULSION.
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THEORETICAL AND EXPERIMENTAL DEVELOPMENTS OF SOVIET GAS LASER RESEARCH AND IN THE GENERAL MASS FIELD.
AD-282 253 DIV. 25

*VACUUM SYSTEMS

ANALYTICAL AND EXPERIMENTAL STUDY OF ADAPTIVE BEARINGS FOR USE IN AN ULTRA-HIGH VACUUM ENVIRONMENT. SCREENING OF DRY LUBRICANTS FOR USE IN HIGHLY LOADED LOW-SPEED BEARINGS AND GEARS. OUTGASSING DETERMINATION OF SELF-LUBRICATING COMPOSITES AND PLASTICS.
AD-282 625 DIV. 30

*VAN ALLEN RADIATION BELT

A METHOD FOR THE ANALYTICAL TREATMENT OF RADIO PHENOMENA IN THE TERRESTRIAL MAGNETOSPHERE.
AD-282 401 DIV. 2

*VANADIUM

THERMODYNAMIC PROPERTIES OF THE SYSTEMS NB-H, V-H, AND TA-H DETERMINED USING THE EQUILIBRIUM PRESSURE METHOD TO MEASURE SOLUBILITY. H WAS FOUND MORE SOLUBLE IN NB THAN IN V OR TA.
AD-282 433 DIV. 4

*VANADIUM ALLOYS

HIGH-TEMPERATURE OXIDATION PROTECTIVE COATINGS FOR VANADIUM-BASE ALLOYS.
AD-282 352 DIV. 17

PILOT EVALUATION OF VANADIUM ALLOYS. FABRICATION AND MECHANICAL PROPERTY DATA.
AD-282 516 DIV. 17

*VANADIUM COMPOUNDS

PREPARATION OF SEVERAL MIXED OXIDES OF SPINEL STRUCTURE CONTAINING TRIVALENT OR TETRAVALENT VANADIUM AS A PRINCIPAL CONSTITUENT IN ORDER TO INVESTIGATE THE POSSIBLE EFFECT OF DIRECT CATION-CATION INTERACTIONS ON THE PROPERTIES OF THE D ELECTRONS.
AD-282 542 DIV. 25

*VAPOR PLATING

PAPERS ON CHEMICAL VAPOR DEPOSITION INCLUDING POSSIBILITIES AND PROBLEMS OF CHEMICAL VAPOR DEPOSITION, GROWTH OF CRYSTALLINE FILMS, WHISKER GROWTH, VAPOR DEPOSITION OF DIFFUSION COATING, VAPOR-PHASE TRANSFER PROCESSES
AD-281 887 DIV. 25

*VAPORS

A HERMETICALLY-SEALED COUPLING FOR A SPACE POWER TRANSMISSION FOR A 15 KW, 24,000 RPM POWER UNIT.
AD-282 710 DIV. 7

*VARIABLE CAPACITORS

MASS-PRODUCTION EQUIPMENT AND REQUIREMENTS FOR MANUFACTURE OF VARIABLE CAPACITORS.
AD-281 867 DIV. 9

*VEHICLES

MAINTENANCE OF VEHICLES AND CONSTRUCTION EQUIPMENT IN ARCTIC REGIONS.
AD-281 883 DIV. 13

CORRELATION OF SINGLE TIRE TEST RESULTS WITH TC SAND-MOBILITY RESULTS.
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*VEHICLES
STORAGE

A TEST OF AN ELECTROLYTIC PAINT SYSTEM TO REDUCE ATMOSPHERIC CORROSION ON MILITARY VEHICLES IN STORAGE. COMPARISON OF ELECTROLYTIC AND CONVENTIONAL METHODS OF CORROSION CONTROL OF EXTERIOR FINISHES.
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*VENUS

MOLECULAR OPTICAL THICKNESS OF THE ATMOSPHERE OF MARS AND VENUS PROBED BY WAVELENGTH OF INCIDENT SOLAR RADIATION.
AD-283 055 DIV. 2

*VERTICAL GUST RECORDERS

VERTICAL VELOCITIES OBTAINED FROM AIRCRAFT ACCELEROMETER MEASUREMENTS IN A SEVERE THUNDERSTORM.
AD-282 770 DIV. 1

*VERTICAL TAKE-OFF PLANES
CONTROL SYSTEMS

GROUND AND FLIGHT TEST EVALUATION OF THE ROBERTSON ULTRA-LOW SPEED FLIGHT CONTROL SYSTEM.
AD-282 123 DIV. 9

SIMULATOR STUDY OF LONGITUDINAL CONTROL AND FLIGHT-HANDLING CHARACTERISTICS OF V/STOL AIRCRAFT DURING TRANSITION FROM HOVER TO LEVEL FLIGHT.
AD-283 081 DIV. 1

*VERY HIGH FREQUENCY

THE RADIATION OF ELECTROMAGNETIC ENERGY IN AN ANISOTROPIC PLASMA EXCITED BY A FINITE CURRENT DISTRIBUTION IS DISCUSSED.
AD-282 154 DIV. 25

*VERY LOW FREQUENCY

THE RADIATION OF ELECTROMAGNETIC ENERGY IN AN ANISOTROPIC PLASMA EXCITED BY A FINITE CURRENT DISTRIBUTION IS DISCUSSED.
AD-282 154 DIV. 25

*VIBRATION

A 2-DIMENSIONAL HETEROGENEOUS DYNAMIC PLATE THEORY WAS DEDUCED FROM THE 3-DIMENSIONAL DYNAMIC EQUATIONS OF ELASTICITY.
AD-281 788 DIV. 25

*VIBRATION
DAMPING

DAMPING BY NITRILE RUBBER OF HEAVY PLATING IN NEW CONSTRUCTION SUBMARINES. EFFECTIVENESS AT TEMPERATURES OF 38 TO 120 F.
AD-281 835 DIV. 31

*VIDEO FILTERS

SPATIAL FILTERING OF 2-DIMENSIONAL PICTORIAL DATA FOR ENHANCING THE DETECTION OF LOCALIZED OBJECTS SUPERIMPOSED UPON A NOISY BACKGROUND. THE MATCHED FILTERS WHICH ARE DERIVED ARE LINEAR, QUADRATIC, GENERAL STATISTICAL, AND DECISION TYPES.
AD-282 766 DIV. 9

*VIRUSES

TWENTY-EIGHT INDIVIDUAL REPORTS ON VARIED ASPECTS OF BIOLOGY AEROBIOLOGY, BACTERIOLOGY, MYCOLOGY, VIROLOGY, ECOLOGY AND EPIDEMIOLOGY, BIOPHYSICS, ETC.
AD-282 360 DIV. 16

*VISCOSITY

INLET MACH NUMBERS ABOVE A CRITICAL VALUE IMPEDE THE ISOTHERMAL AND ADIABATIC FLOW OF A VISCOUS GAS THROUGH A LONG STRAIGHT CHANNEL, OTHER FACTORS BEING CONSTANT.
AD-281 877 DIV. 9

THERMO-VISCOELASTIC STRESSES IN A SPHERICAL CAVITY ARE ANALYZED FOR UNIFORM INITIAL TEMPERATURE AND CAVITY ABLATION AT AN ELEVATED CONSTANT SURFACE TEMPERATURE.
AD-282 741 DIV. 25

*VISIBILITY

AN ANALYSIS OF THE FACTORS AFFECTING THE SIGHTING OF SURFACE VESSELS FROM AIRCRAFT DERIVED FROM 3,465 COAST GUARD REPORTS. ANALYSIS OF EACH OF 17 CONDITIONS AFFECTING VISIBILITY, SUCH AS METEOROLOGICAL CONDITIONS, ALTITUDE, SHIP SIZE, SWELL HEIGHT, SUN, BAKE SIZE, ETC.
AD-281 804 DIV. 6

*VISION
PROTECTIVE COVERINGS

ELECTROCHEMICAL LIGHT MODULATOR. LIGHT SHUTTER. PLATING CELL. PLATING CURRENT AND OPTICAL DENSITY CHANGES. FLASH SENSOR. PULSE DIFFERENTIATORS AND AMPLIFIERS. SILICON CONTROLLED RECTIFIERS. POWER SUPPLY. FLASH DETECTION AND DISCRIMINATION.
AD-283 118 DIV. 1

*VISUAL PERCEPTION

A PROJECT REPORT ON VISUAL PERCEPTION STUDIES AT UCLA: EEG CORRELATES; THE PHENOMENON OF PERCEPTUAL BLANKING; THE PERCEPTUAL INTERFERENCE OF SUCCESSIVELY PRESENTED VISUAL STIMULI; THE LATENCY HYPOTHESIS OF INTERFERENCE WITH SUCCESSIVE PRESENTATION; AND OTHERS.
AD-281 910 DIV. 28

*VITAMINS
BIOCHEMICAL TESTS

MICROBIOLOGICAL ASSAY PROCEDURES FOR BIOTIN, FOLIC ACID, NICOTINIC ACID, PANTOTHENIC ACID, AND RIBOFLAVIN.
AD-282 974 DIV. 16

*VOCATIONAL TESTS

SELF-RATINGS OF APTITUDES BY HIGH SCHOOL STUDENTS FOUND RELATED TO VOCATIONAL DEVELOPMENTAL PROGRAMS BUT A HIGHER CORRELATION BETWEEN APTITUDE TEST AND ACHIEVEMENT.
AD-282 481 DIV. 23

EVALUATION OF PERSONNEL SELECTION SYSTEMS. CRITERIA FOR WORK SYSTEMS WHICH SELECTION SYSTEMS ARE DESIGNED TO SUPPORT. A THEORY OF INDUSTRIAL MOTIVATION. DEVELOPMENT OF INSTRUMENTS FOR ASSESSING THE MOTIVATION OF A POTENTIAL WORKER.
AD-282 796 DIV. 23

*VOICE COMMUNICATION SYSTEMS

PERFORMANCE OF DATA TRANSMISSION TERMINALS OVER TACTICAL MILITARY COMMUNICATION SYSTEMS.
AD-282 949 DIV. 5

BANDWIDTH LIMITING EFFECTS OF FREQUENCY SELECTIVE FADING OVER TROPOSPHERIC SCATTER PATHS. DEVELOPMENT OF DESIGN CURVES FOR PREDICTING THE INTERMODULATION DISTORTION INTRODUCED.
AD-282 967 DIV. 5

DESIGN STUDY FOR A VARIABLE-RATE, FULL-DUPLEX VOCODER SYSTEM.
AD-282 986 DIV. 30

*VOICE COMMUNICATION SYSTEMS
RADIO RANGES

FAILURE OF SYNCHRONIZED SELECTIVITY AS A METHOD OF IMPROVING VOICE COMMUNICATION FM RECEIVERS.
AD-282 446 DIV. 5

*VOLTAGE REGULATORS

VOLTAGE REGULATION AND POWER STABILITY IN UNCONVENTIONAL ELECTRICAL GENERATOR SYSTEMS. INTERNAL VOLTAGE CONTROL OF POWER SOURCES AND EXTERNAL VOLTAGE CONVERSION AND REGULATION.
AD-282 718 DIV. 7

*VORTICES

ELECTROMAGNETIC PHENOMENA OBSERVED IN RELATIVE INTERMOLECULAR OR IONIC MOTION IN FLUID FLOWS ARE DISCUSSED. ELECTROGASDYNAMICS.
AD-282 167 DIV. 9

THE EFFECT OF COMBUSTION CHAMBER GEOMETRY ON GAS FLOW IS INVESTIGATED BY MEANS OF A VORTEX-FLOW WATER MODEL STUDY.
AD-282 961 DIV. 27

*WARHEADS
DESIGN

START OF A STUDY OF EXPLOSIVE DRIVER FLOW IN SYSTEMS WITH CYLINDRICAL SYMMETRY AND DEVELOPMENT OF A COMPUTER PROGRAM.
AD-282 232 DIV. 9

*WATER

AN ATTEMPT WAS MADE TO REMOVE TRACE AMOUNTS OF WATER FROM MINERAL OIL BY REACTION WITH ORGANIC ADDITIVES. NO RELIABLE ADDITIVE WAS FOUND.
AD-282 237 DIV. 14

*WATER
INHIBITION

DETERMINING A METHOD TO INHIBIT THE INTERACTION OF ALKALI PERCHLORATE AND WATER. ATTEMPTS WERE MADE TO COAT THE POWDER WITH MAGNESIUM, ALUMINUM, CARBONATE, FLUORINE, AND SEVERAL ORGANIC MATERIALS.
AD-282 763 DIV. 4

*WATER VAPOR

NUCLEATION IN CONDENSATION FROM THE VAPOR PHASE ONTO A SUBSTRATE.
AD-282 150 DIV. 25

*WATER VAPOR
PARAMAGNETIC RESONANCE

OXYGEN-WATER VAPOR MIXTURES UNDER RF EXCITATION BY ELECTRON-PARAMAGNETIC RESONANCE INDICATE THIS METHOD FEASIBLE FOR MEASURING THE COMBUSTION PROPERTIES OF FUEL MIXTURES.
AD-282 484 DIV. 4

# TECHNICAL ABSTRACT BULLETIN

## 1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-281 703 Div. 1
(TISTP/JW) OTS price $2.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
ACOUSTIC COMPONENT OF TURBULENCE,
by Willis L. Webb. July 62, 15p. incl. illus. 7 refs. (Technical rept. no. MM-456)
Unclassified report

DESCRIPTORS: *Turbulent flow, *Fluid flow, Thermodynamics, Flight paths, Lift, Drag, High altitude, Perturbation theory, Atmosphere, Aerodynamics, Space environmental conditions.

The intimate relationship between the local speed of sound of a flight environment and the lift and/or drag on a vehicle is discussed. The fact that this parameter will become increasingly significant as the speed increases is pointed out. In addition, it is noted that the usual source of flight bumpiness, wind variations, tends to become less effective as the speed increases. Examples of the sonic gradients which have thus far been observed in the high altitude regions of the earth's atmosphere are presented, and the circumstances under which such gradients would be most effective in perturbating a particular flight path are described. It is concluded that the variable vehicle loads imposed by atmospheric structure are composed of flow and thermodynamic components, and that both of these atmospheric parameters must be studied in the light of our expanding speed and spatial activities. (Author)

AD-281 738 Div. 1, 7
(TISTA/VGW) OTS price $2.60

HRB-Singer, Inc., State College, Pa.
DESIGN RECOMMENDATIONS FOR A MOBILE RUNWAY LIGHTING SYSTEM,
by Robert B. King and Frederick H. Kresse. 1 July 62, 22p. incl. illus. table, 7 refs. (Rept. no. 353-R-1)
(Contract AF 19(628)439)
(ESD TDR 62-188)
Unclassified report

DESCRIPTORS: *Runway lights, *Lighting systems, *Air traffic control systems, Air force operations, Airborne, Design, Specifications, Jet planes, Mobile.

This report establishes design recommendations for a mobile runway lighting system to handle jet aircraft in weather conditions down to 1/2 mile visibility and 200 ft ceiling. Intended for use in the AN/TSQ-47 Mobile Air Traffic Control Communication System (Augmented 'Four-Wheels') the lighting system had to be within the state-of-the-art, and comply fully with the AN/TSQ-47 specifications for power, air transportability, limited field maintenance, adaptability to environmental extremes, and rapid installation and take-down. (Author)

AD-281 862 Div. 1, 18
(TISTA/GEC) OTS price $6.60

Naval Air Test Center, Patuxent River, Md.
OPTIMUM WIND-OVEN-DECK FOR SHIPBOARD RECOVERY OPERATIONS WITH CARRIER BASED AIRPLANES.
Rept. no. 2 (Final),
by R. M. Decker and N. A. Castruccio. 21 June 62, 62p. incl. illus. (Serial no. FT 2222-176)
Unclassified report

DESCRIPTORS: *Carrier landings, *Wind, Naval aircraft, Aircraft carriers, Effectiveness, Aviation safety, Jet fighters, Jet bombers, Naval operations, Operations research, Transport planes, Velocity.

A study was made of the effect of airflow disturbance aft of the ramp and in the landing area on the pilot's ability to make a precise carrier final approach and landing. Tests conducted on board USS MIDWAY (CVA-41), USS RANGER (CVA-61), USS CORAL SEA (CVA-43) and USS SARATOGA (CVA-60) determined that, from the pilot's viewpoint, a Wind-Over-Deck (WOD) of 25 kt for jet and 15 kt for propeller airplanes is optimum. The determination of an optimum WOD was predicated upon operational feasibility as well as pilot considerations. A 25 kt WOD, in comparison with a 35 kt WOD accrued the following advantages for jet airplanes: Less demanding on the pilot; reduction in landing gear loads; improved approach airspeed control; less deviation in alignment; and increased jet recovery flexibility. The increased closure rate of a reduced WOD resulted in the following disadvantages: Earlier wave-off initiation; slightly degraded landing dispersion; and increased bolter rate. Based on arresting gear and/or airplane limits, fleet capability for utilizing a reduced WOD was determined. (Author)

AD-282 036 Div. 1
(TISTB/AW) OTS price $1.60

Naval Research Lab., Washington, D. C.
A METHOD FOR THE ESTABLISHMENT OF THE QUICKENING TERMS FOR AN IMPROVED BINARY ANGLE OF ATTACK DISPLAY,
by Alan W. Baldwin, Barbour Lee Perry and others. 17 July 62, 12p. incl. illus. 3 refs. (NRL rept. no. 5778)
Unclassified report

DESCRIPTORS: *Angle of attack indicators, *Display systems, Stabilization, Servo systems, Control systems, Jet planes, Mathematical analysis, Integral transforms, Landing, Design, Analog computers, Simulation, Effectiveness.

The development of a quickening term for the stabilization of high-order systems through the use of mathematical analysis together with analog computer simulation of the system dynamics and the design of appropriate circuitry modification are investigated. This method was developed to facilitate the design of an improved binary-type light display used in jet aircraft to indicate a 'too high' or 'too low' angle of attack condition. The mathematical analysis was effected through the use of Laplacian transform theory by means of which a synthesized simulation, structurally unlike but mathematically

AD-282 345 Div. 1
(TISTA/GEC) OTS price $3.60

4750th Test Squadron (Tactics and Application Engineering), Tyndall Air Force Base, Fla.
Q-2C PIN POINT LAND RECOVERY.
Final rept., 15 Jan-15 Apr 62,
by Joel Sucov. 15 May 62, 29p. incl. illus. tables (Proj. ADC/73AD/62-3)
Unclassified report

DESCRIPTORS: *Target drones, *Recovery, Landing, Flight testing, Effectiveness, Operations research, Feasibility studies, Maintenance, Statistical analysis, Parachute descents, Parachutes.

Because of operational and maintenance problems associated with water recovery of Firebee drone targets, a project was established to develop a land recovery capability and evaluate its overall effectiveness. For the most part, structural and equipment damage incurred by land recovered drones was minor. The average man-hour expenditure to rehabilitate a land recovered drone was 36% less than required to rehabilitate a water recovered drone. In addition, for a land recovered drone, the maintenance turn around time in clock hours was reduced. To achieve these benefits, however, mission range time is compromised by the loss of approximately 30% of the available on-station time per drone flight. This sacrifice of available on station time can generate a requirement for additional drone flights. The test demonstrated that the pinpoint land recovery concept can be utilized to support daily Weapons Center requirements with a resultant decrease in maintenance workload and decrease in target range time. (Author)

AD-282 420 Div. 1, 18
(TISTA/GEC) OTS price $1.60

Hughes Aircraft Co., Culver City, Calif.
CONTROL DATA INVESTIGATION FOR OPTIMIZATION OF FUEL ON SUPERSONIC TRANSPORT VEHICLES.
Quarterly technical rept. no. 1, 1 June-29 July 62.
30 July 62, 15p. incl. illus. (Rept. no. 62H-4459/9299)
(Contract AF 33(657)8822, Proj. 9056)
Unclassified report

DESCRIPTORS: *Transport planes, *Fuel consumption, Aerodynamic configurations, Air force operations, Jet planes, Research program administration, Control, Operations research.

A study was begun on supersonic transport (SST) fuel optimization control data. Four areas studied were: definition of typical SST aerodynamic and propulsion system characteristics, development of the initial dynamic programming optimization program, development of the basic over-all mission optimization program, and extension of dynamic programming into an over-all mission optimization for determination of reserve fuel requirements. (Author)

AD-282 454 Div. 1, 9, 14
(TISTA/GEC) OTS price $21.00

Air Force Office of Scientific Research, Washington, D. C.
PROCEEDINGS OF A CONFERENCE ON AERODYNAMICALLY HEATED STRUCTURES, SPONSORED JOINTLY BY THE AIR FORCE OFFICE OF SCIENTIFIC RESEARCH AND ARTHUR D. LITTLE, INC., HELD AT CAMBRIDGE, MASSACHUSETTS, JULY 25-26, 1961,
ed. by Peter E. Glaser. 1962, 363p. incl. illus. tables, refs.
Unclassified report

DESCRIPTORS: *Structures, *Thermal insulation, *Conferences, *Aerodynamic heating, Hypervelocity vehicles, High temperature research, Liquid rocket propellants, Propellant tanks, Cryogenics, Cooling, Composite materials, Thermal radiation, Configuration, Ablation, Heat transfer, Surface properties, Impregnation, Resins, Ceramic materials, Stresses, Shielding, Re-entry vehicles, Re-entry aerodynamics, Design.

Papers on the structural and materials requirements of space vehicles exposed to aerodynamic heating, particularly during re-entry, are presented. The current status of insulating problems, especially in lift-flight vehicles, is discussed, as are proposed thermal protection systems for future aerospace vehicles. Reports on new developments of high-temperature thermal protection systems, thermal protection of cryogenic propellants, and structural cooling systems are included. (Author)

AD-282 750 Div. 1
(TISTA/GEC) OTS price $11.50

Douglas Aircraft Co., Inc., El Segundo, Calif.
ADVANCED ARMY AIRCRAFT INSTRUMENTATION SYSTEM.
Quarterly progress rept. no. 1 for period ending 30 June 62,
by J. N. Cahow, R. A. Lennel and others.
30 June 62, 148p. incl. illus. tables.
(Contract DA 36-039-sc-87354)
Unclassified report

DESCRIPTORS: *Flight instruments, *Display systems, Instrumentation, Design, All-weather aviation, Automatic pilots, Doppler navigation, Horizontal indicators, Vertical indicators, Gyroscopes, Airspeed indicators, Computers, Radar equipment, Fuel gages, Terrain, Identification systems, Television equipment, Infrared detectors, Flight paths, Instrument panels, Instrument dials, Aircraft equipment.

The design of an advanced flight instrument display for self-sufficient all-weather aircraft operations from remote areas was studied. Precise self-contained navigation, inflight data processing and optimization of sensors, displays, and controls were required. With the provision of suitable sensory devices, it is expected that the display system mechanization described herein will support these requirements. The system will be installed in an L23D aircraft and evaluated. (Author)

AD-282 770 Div. 1, 2
(TISTP/GRW) OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
VERTICAL VELOCITIES OBTAINED FROM AIRCRAFT ACCELEROMETER MEASUREMENTS IN A SEVERE THUNDERSTORM,
by Toby N. Carlson and Morton Glass. May 62, 11p. incl. illus. tables, 6 refs. (Rept. no. AFCRL 62-499)
(Proj. 8620; In cooperation with Weather Services, Inc., Boston, Mass.)
Unclassified report

DESCRIPTORS: *Jet training planes, *Gust loads, *Vertical gust recorders, *Thunderclouds, Storms, Measurement, Accelerometers, Arizona.

A penetrative flight by a T-33 aircraft was made through a large thunderstorm on 26 July 1960 over northern Arizona. From instruments recording airplane acceleration, angle of attack, and pitch angle, precise measurements (±2 ft/sec) yielded a vertical velocity every 60 ft of flight

equivalent to the original simulation can be developed. The simplified configuration of this synthesized simulation facilitates the determination of the propert quickening needed to stabilize both the synthesized and the original simulation. Results of the test evaluation of the improved simulation show an increase in accuracy of almost four to one compared with the performance with a conventional display. (Author)

AD-282 087 Div. 1
(TISTA/GEC) OTS price $1.60

Army Transportation Research Command, Fort Eustis, Va.
HELICOPTER STATIC-ELECTRICITY MEASUREMENTS. Interim rept.,
by James W. Seibert. June 62, 10p. incl. illus.
(TCREC Technical rept. no. 62-72)
Unclassified report

DESCRIPTORS: *Helicopters, *Static electricity, Measurement, Test methods, Test equipment, Climatic factors, Flight testing.

Static-electricity measurements were made of helicopters. The highest voltage accumulation was measured at the Arctic Test Board, with downwash blowing snow in the rotor blade path. The data obtained at Edwards Air Force Base, California, indicated that there was a larger current generation and voltage accumulation during operations in blowing dust than was experienced in relatively clear air. The maximum voltage accumulation measured was 200,000 v, and the maximum charging current was 50 microamperes. (Author)

AD-282 111 Div. 1, 2, 8, 10, 14, 17, 18, 23, 28, 30
(TISTB/MS) OTS price $1.25

Federal Aviation Agency, Washington, D. C.
BIBLIOGRAPHIES OF TECHNICAL REPORTS. INFORMATION RETRIEVAL LIST NO. 1.
July 62, 45p.
Unclassified report

DESCRIPTORS: *Bibliography, *Scientific reports.

AD-282 161 Div. 1, 9
(TISTA/GEC) OTS price $7.60

Princeton U., N. J.
LONGITUDINAL HANDLING QUALITIES FOR HOVERING,
by E. Seckel, J. J. Traybar, and G. E. Miller.
Dec 61, 64p. incl. illus. tables, 15 refs.
(Rept. no. 594)
(Contract DA 44-177-tc-524, Proj. 9-38-01-000)
Unclassified report

DESCRIPTORS: *Helicopters, *Stability, Gusts, Turbulence, Velocity, Pitch, Damping, Effectiveness, Handling Control, Flight testing.

Flight tests with a variable stability helicopter were conducted to determine the effect of certain stability parameters on precision hovering in atmospheric turbulence. A course was devised to emphasize the precision control required to pick up sling loads, deliver litter patients, dunk Sonar buoys, etc., under gusty conditions. The effect of velocity stability was determined to be of particular importance. The most important effect is that the pitching disturbances felt by the pilot due to turbulence are essentially proportional to this parameter. Secondary effects are the control gradient for trim at low speed, and the dynamic stability. The range of velocity stability variation was from practically zero, which was considered very favorable, to values that were unacceptable or even disastrous. Certain pilot ratings did not correspond to previously published handling qualities criteria. Investigation disclosed that higher angular damping and greater control effectiveness are desired by pilots for precision hovering than had been determined. (Author)

AD-282 207 Div. 1, 9
(TISTA/GEC) OTS price $1.50

Directorate of Engineering Test, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
FLIGHT VIBRATION SURVEY OF F-106A AIRCRAFT. Final rept.,
by H. Kent Reich. May 62, 37p. incl. illus. tables,
(Proj. 1309)
(ASD TDR 62-504) Unclassified report

DESCRIPTORS: *Jet fighters, *Aerodynamic data, Air force operations, Flight testing, Measurement, Specifications, Test methods, Instrumentation, Data processing systems, Analysis, Vibration.

An F-106A aircraft was surveyed to determined the vibration environment existing throughout the vehicle under all flight conditions expected in service. Approximately 18,890 data points were obtained from 25 separate locations on the vehicle during 23 test flights. The data obtained were evaluated to determine the adequacy of vibration test requirements for aircraft equipment as contained in Specification No. Mil-E-5272C. The data indicated that the vibration testing requirements of the specification are more than adequate, a finding substantiated by all previous (vibration) surveys performed on Century Series aircraft. (Author)

AD-282 230 Div. 1, 14
(TISTM/AW) OTS price $19.75

Goodyear Aircraft Corp., Akron, Ohio.
EVALUATION OF HIGH-TEMPERATURE CAST-IN-PLACE TRANSPARENT PLASTIC LAMINATES SUITABLE FOR CANOPIES ON SUPERSONIC FIGHTER AIRCRAFT. Final technical rept.
May 62, 297p. incl. illus. tables, 18 refs.
(Rept. no. GER-10680)
(Contract NOa(s) 59-6146-c)
Unclassified report

DESCRIPTORS: *Aircraft canopies, *Laminates, *Transparent panels, Plastics, Tests, Casting, Supersonic planes, Epoxy resins, Glass, Thermal stresses, Pressure, Jet fighters, Aerodynamic heating, Acrylic resins, Polymers, Thermal insulation, Windshields.

The feasibility of a high temperature resistant transparent plastic laminate utilizing a castable interlayer is demonstrated for high performance aircraft. To protect against aerodynamic heating at speeds much in excess of Mach 2, the laminate incorporates an inboard load-carrying or structural face sheet of stretched MIL-P-8184 acrylic which is shielded from thermal degradation by an outboard, nonload-bearing high temperature resistant thermal barrier or insulating face sheet. The two face sheets are laminated together to form one integral composite glazing material with a tough and flexible castable interlayer. Laminating grade as-cast MIL-P-8184 acrylic was selected as the outboard thermal barrier face sheet in a Thermo-Shield laminate. Thermal barrier materials which were investigated in addition to the as-cast Plex 55 include Sierracin 880, Sierracin 890, Selectron 400, Polymer K, epoxy, and soda-lime plate glass. (Author)

Temperature, Structures, Stresses, Simulation, Test methods, Torque, Joints, Test facilities, Construction.

A test device that is capable of simulating, on a small scale, the dynamic loads and environmental conditions present in actual aircraft integral fuel tanks was successfully developed and tested. Sixteen integral test tanks were sealed with eight different sealing systems and evaluated on the dynamic test device. Five of the eight sealing systems were considered very satisfactory and judged equal in ability to provide a reliable sealing system. The remaining systems (a fluorocarbon fillet sealed system and two structural adhesive systems) were considered unsatisfactory because of excessive leakage. The effects of a jet fuel anti-icing additive (Phillips Fuel Additive No. 55MB) on the sealing materials used in the test tanks and in laboratory control tests were also evaluated. The anti-icing additive was compatible with all of the sealing materials tested. (Author)

AD-283 038 Div. 1, 9
(TISTA/VGW) OTS price $8.60

Hydraulic Engineering Lab., U. of Calif., Berkeley.
RESEARCH ON ANNULAR NOZZLE TYPE GROUND EFFECT MACHINE OVER WATER.
Preliminary rept.,
by R. L. Wiegel, D. O. Horning and others.
Mar 62, 95p. incl. illus. tables, 12 refs.
(Series no. 187, Issue no. 1)
(Contract Nonr-22271)
Unclassified report

DESCRIPTORS: *Flying platforms, Nozzles, Design, Ground effect, Model basins, Water waves, Lift, Pressure gages, Instrumentation, Test facilities, Test equipment, Test methods, Aerodynamics, Model tests.

It was desired to determine the characteristics of a ground effect machine (GEM) of the annular nozzle type operating over water in the presence of waves. As the primary forces to be considered were inertia and gravity, a Froude number was used in constructing and testing the model. The characteristics of a GEM moving over waves was studied using a rigidly mounted model which was dynamically similar to the 300-ft diameter, 5,000,000 lb gross weight prototype. To obtain information on the forces acting on the model, measurements of lift and bending moment in the direction of GEM advance were made, together with the pressure field over the base plate. Measurements of drag were not made because the ''wind drag'' on the appendages were so large that they masked the true drag.

AD-283 039 Div. 1, 9
(TISTA/GEC) OTS price $2.60

Hydraulic Engineering Lab., U. of Calif., Berkeley.
RESEARCH ON ANNULAR NOZZLE TYPE GROUND EFFECT MACHINE OPERATING OVER WATER: NONUNIFORMITY OF JET MOMENTUM,
by Gunnar Sigurdsson. 31 Mar 62, 28p. incl. illus. 8 refs. (Series no. 187, Issue no. 5)
(Contract Nonr-22271)
Unclassified report

DESCRIPTORS: *Flying platforms, *Exhaust nozzles, Water, Jets, Fluid flow, Water waves, Wake, Pressure, Resistance, Model tests, Ground effect, Aerodynamics.

A limited number of experiments indicate that the jet momentum is nonuniformly distributed around the periphery of a ground effect machine operating over water. An attempt is made to correlate the distribution of jet momentum with the water surface configuration under the machine and with the wake pattern created by the machine. The theoretical solutions for the wave resistance that acts on a moving pressure area are discussed. The data presented in this paper indicate that this wave resistance does not have to be transmitted to the ground effect machine. (Author)

AD-283 074 Div. 1, 10
(TISTA/VGW) OTS price $1.60

Beech Aircraft Corp., Wichita, Kans.
PROTOTYPE DEVELOPMENT MODEL 385 AIR REFUELING STORE.
Interim rept. no. 26, 1-31 July 62,
by C. V. Lassmann. 8 Aug 62, 11p. incl. illus.
(Engineering rept. no. 4473)
(Contract NOw 60-0060-c)
Unclassified report

DESCRIPTORS: *Hose, *Refueling in flight, Storage, Design, Test equipment, Model tests, Airplane refueling, Hose reels.

Ground tests are reported of the prototype Beech Model 385 Air Refueling Store. Ground operational testing of the prototype store has been halted to permit realignment of the remaining testing with the other phases of the development program. (Author)

AD-283 081 Div. 1, 9
(TISTA/VGW) OTS price $16.00

Bell Aerosystems Co., Buffalo, N. Y.
CONTROL CHARACTERISTICS OF V/STOL AIRCRAFT IN TRANSITION,
by C. Henderson, J. Kroll, and A. Hesby.
1 July 62, 223p. incl. illus. tables, 10 refs.
(Rept. no. 2023-917002)
(Contract NOw 61-0859f)
Unclassified report

DESCRIPTORS: *Vertical take-off planes, *Short take-off planes, *Flight simulators, Control simulators, Stability (Longitudinal), Flight paths, Flight speeds, Pitch, Roll, Yaw, Analog systems, Damping, Control systems.

A simulator study was made of the longitudinal control and flight handling characteristics of three types of V/STOL aircraft during the transitional phase of flight between hover and conventional level flight. The aircraft configurations studied were in the 35,000 pound weight class and of the following types: (1) dual tandem ducted propeller, (2) tilt rotor, and (3) tilt wing with deflected slipstream. Flight evaluation of control power and damping were conducted to determine pilot rating boundaries for each configuration. Other aerodynamic and control parameters investigated were: (1) speed stability parameter, (2) static stability parameter, (3) change in pitching moment due to change in thrust, (4) conversion rate, (5) throttle gradient and (6) slope of the power required curve. (Author)

AD-283 107 Div. 1, 18
(TISTA/VGW) OTS price $3.60

Naval Air Test Center, Patuxent River, Md.
OPTIMUM WIND-OVER-DECK FOR SHIPBOARD RECOVERY OPERATIONS WITH CARRIER BASED AIRPLANES.
Rept. no. 2.
12 July 62, 2p. illus. tables (Serial no. FT2222-215; Suppl. to Serial no. FT2222-176, AD-281 862)
Unclassified report

DESCRIPTORS: *Aircraft carriers, *Carrier landings, *Flight deck, Naval aircraft, Roll, Landing gear, Failure (Mechanics), Airplane landings, Tables, Aviation safety, Wind.

path. Calculated velocities differed from the true motions by a constant of integration. Evaluating the constant by alternate procedures produced two velocity distributions, differing from each other by a constant. (Author)

AD-282 852 Div. 1, 7, 14, 26
(TISTM/MS) OTS price $2.25

General Electric Co., Schenectady, N. Y.
DESIGN CRITERIA FOR BEARING SYSTEMS FOR USE IN HIGH TEMPERATURE AIRCRAFT ELECTRICAL ACCESSORIES.
Final rept., May 58-Aug 61 on Power Conversion and Transmission Technology, Phase 3,
by P. Lewis. May 62, 78p. incl. illus. tables, 7 refs.
(Contract AF 33(616)5766, Proj. 8128)
(ASD TR 61-232) Unclassified report

DESCRIPTORS: *Aircraft equipment, *Electrical equipment, *Ball bearings, *Lubricants, *Greases, Silicones, High temperature research, Temperature, Lubrication.

A program is described which had as its objective the attainment of several cycles of operation including portions at 700 F and the simulated pressure of 80,000 feet. Major attention was given to grease packed bearing systems. The most successful performance was obtained with both an auxiliary grease supply and periodic injection of base fluid to the grease. A circulating grease system is described which shows promise for improved elevated temperature operation. Some attention was given to the use of an oil lubricated system. This was not as promising as the grease system. Dry Operation is discussed, and preliminary data are presented. (Author)

AD-282 878 Div. 1, 7
(TISTW/PCR) OTS price $3.50

Sundstrand Aviation-Denver, Pacoima, Calif.
A FEASIBILITY STUDY OF A THIONINE PHOTOGALVANIC POWER GENERATION SYSTEM.
Rept. for Mar 61-Feb 62,
by L. J. Miller. May 62, 219p. incl. illus. tables, 75 refs.
(Contract AF 33(616)7911, Proj. 8173)
(ASD TDR 62-373) Unclassified report

DESCRIPTORS: *Electric power production, *Power supplies, Phenothiazine derivatives, Amines, Structures, Absorption, Decomposition, Iron, Optical systems, Electronic equipment, Electrodes, Configuration, Surface area, Theory, Experimental data, Additives, Illumination, Temperature, Angle of arrival, Deterioration.

A feasibility study was conducted of the thionine photogalvanic system for converting solar energy to electrical energy. Theoretical and experimental investigations were made to determine the maximum voltage and power available from the system. The effects of operating conditions as well as solution composition variables on cell performance were studied. The low attainable concentration of leucothionine in the photostationary state at present prevents the utilization of the photogalvanic cell as a practical device. Electrode activation and long term dye stability are also important problems. Cell voltages up to 220 mv and power levels up to 1.8 micro watts were obtained. Although the voltage does not represent an improvement over the best previously reported voltage, the power is 1000 times more than the only other reported value. Estimates of the power, weight and cost of a photogalvanic cell have been made on the basis of present knowledge. Recommendations are made for more fundamental investigations to develop a better understanding of this system or similar systems, so that practical devices can be made. (Author)

AD-282 879 Div. 1
(TISTA/GEC) OTS price $2.50

Systems Technology, Inc., Inglewood, Calif.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF SOME NEW LONGITUDINAL HANDLING QUALITIES PARAMETERS.
Final rept.,
by Henry R. Jex and Charles H. Cromwell, III.
June 62, 90p. incl. illus. tables, 29 refs.
(Contract AF 33(616)5661, Proj. 8219)
(ASD TR 61-26) Unclassified report

DESCRIPTORS: *Control systems, Flight simulators, Stability (Longitudinal), Pitch, Human engineering, Aircraft, Handling, Dynamics, Theory, Tests, Airframes, Mathematical analysis, Servo systems.

The systems-analysis theory of handling qualities (which describes the pilot's adaptive behavior in closed-loop operation by servo techniques, and relates his opinion-ratings to his adapted characteristics and the system performance) is used to reveal some important parameters associated with the numerator terms in the airframe longitudinal transfer function. The predictions are verified by five experienced test pilots operating in a fixed-base aircraft simulator. Four possible numerator effects on handling qualities are analyzed theoretically: short-period lead effect on pitch attitude tracking, static-to-short-period gain effects on attitude tracking, short-period lead effects on the control of short-period divergence, and numerator frequency and damping effects on altitude tracking. The results are correlated with other test work, and the implications of these results on future handling qualities research and specifications are discussed. (Author)

AD-282 893 Div. 1
(TISTA/GEC) OTS price $1.60

Civil Aeromedical Research Inst., Oklahoma City, Okla.
EVACUATION PATTERN ANALYSIS OF A SURVIVABLE COMMERCIAL AIRCRAFT CRASH,
by A. Howard Hasbrook, J. D. Garner and Clyde C. Snow. May 62, 10p. incl. illus. (Rept. no. 62-9)
Unclassified report

DESCRIPTORS: *Aviation safety, *Aviation accidents, Operations research, Commercial planes, Transport planes, Jet planes, Aircraft fires, Analysis, Casualties.

The evacuation pattern of 99 of 106 survivors of a jet transport crash involving a post crash fire is described, factors possibly effecting the suffocation and ultimate death of 16 passengers are listed and photographs and diagrams are presented. (Author)

AD-282 915 Div. 1, 30
(TISTA/VGW) OTS price $2.50

Boeing Co., Wichita, Kans.
TEST DEVICE FOR THE DYNAMIC EVALUATION OF AIRCRAFT FUEL SYSTEM MATERIALS AND STRUCTURES.
Final summary rept., 1 Feb-31 Dec 61 on Aviation Fuels,
by Lyle G. Middleton. June 62, 103p. incl. illus. tables, 10 refs.
(Contract AF 33(616)7847, Proj. 3048)
(ASD TDR 62-91) Unclassified report

DESCRIPTORS: *Fuel systems, *Fuel tanks, *Test equipment, Design, Fuel seals, Sealing compounds, Jet engine fuels, Freezing point depressants, Fuel additives, Model tests,

Four ground patterns were investigated by means of trenches cut in the outwash near Thule, Greenland: circular and linear depressions in unsorted material, polygonal troughs in unsorted material, sorted circles, and irregular mounds and depressions of low relief formed in unsorted finer grained material. Correlation is made between surface pattern, grain size and structure of the active layer, and type and distribution of ground ice for the patterns investigated. Classification of the active layer as disturbed, slightly disturbed, and undisturbed is based on the condition of primary depositional bedding and the presence or absence of vertical sorting. Other features of the active layer, depending upon its type, are an accumulation of fines at the bottom of the active layer and on top of stones, and a siliceous calcareous evaporite on the under surface and clean washed coarser particles beneath the larger stones. (Author)

AD-281 708 Div. 2
(TISTP/FR) OTS price $1.60

Army Cold Regions Research and Engineering Lab., Hanover, N. H.
MECHANISM FOR THE FORMATION OF INNER MORAINES FOUND NEAR THE EDGE OF COLD ICE CAPS,
by Johannes Weertman. Feb 62, 12p. incl. illus. refs. (Research rept. no. 94)
(Proj. 8-66-02-400)
Unclassified report

DESCRIPTORS: *Ice, Glaciers, Deposits, Freezing, Melting, Water.

A new mechanism is described which explains the formation of moraines in the ablation areas of cold ice caps. The mechanism involves the freezing of water onto the bottom surface of an ice cap. This water comes from regions of the bottom surface where the combination of the geothermal heat and the heat produced by sliding of ice over the bed is sufficient to melt ice. A number of criticisms are made of the shear hypothesis, which has been advanced to explain moraines occurring on Baffin Island and near Thule, Greenland. It is concluded that this older hypothesis may be inadequate to account for these moraines. Although in theory the mechanism proposed here undoubtedly would lead to the formation of moraines, the existing field data are insufficient to prove conclusively that actual moraines have originated in this way. (Author)

AD-281 711 Div. 2, 12
(TISTW/PCR) OTS price $1.60

Air Force Proving Ground Command, Eglin Air Force Base, Fla.
ATTITUDE CONTROL FOR A METEOROLOGICAL ROCKET,
by William O. Banks. July 62, 17p. incl. illus. (Rept. no. APGC TDR 62-30)
Unclassified report

DESCRIPTORS: *Sounding rockets, *Control systems, *Satellite attitude, Meteorological instruments, Torque, Servomechanisms.

It will be necessary for meteorological rockets to contain some type of attitude control. This report describes the factors involved in attitude control and develops a theoretical solution. Various known values are used with the formulas proposed to demonstrate the feasibility of the solution. It is concluded that the problem could be solved by applying implusive torquing to bring the longitudinal axis of the rocket into correct alignment to produce the desired attitude. The torque could be applied by a cold propellant discharged by a bang-bang servo mechanism. (Author)

AD-281 749 Div. 2
(TISTP/GRW) OTS price $6.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
SOLAR WIND INTERACTIONS.
Final rept.,
by A. J. Dessler. 14 Apr 62, 75p. incl. illus. tables, refs.
(Contract AF 19(604)7989)
(AFCRL 62-442) Unclassified report

DESCRIPTORS: *Astrophysics, Terrestrial magnetism, Van Allen radiation belt, Cosmic ray bursts, Magnetic effects.

Contents:
Effects of solar wind on magnetosphere
Shape of geomagnetic field in solar wind
Interplanetary effects

AD-281 771 Div. 2
(TISTP/FR) OTS price $1.60

RAND Corp., Santa Monica, Calif.
THE ELECTROMAGNETIC SIGNAL DUE TO THE EXCLUSION OF THE EARTH'S MAGNETIC FIELD BY NUCLEAR EXPLOSIONS,
by W. J. Karzas and R. Latter. Dec 61, 15p.
(Research memo. no. RM-2890-PR)
(Contract AF 49(638)700)
Unclassified report

DESCRIPTORS: *Nuclear explosions, *Electromagnetic waves, *Terrestrial magnetism, Gamma rays, Electrons.

There are three mechanisms by which a vertical magnetic field might be generated by a nuclear explosion. Only two methods are treated. Compton currents produced by explosion gamma rays might interact with the earth's field and generate a back field tending to cancel the earth's field in a region about the explosion. Such a cancellation would be equivalent to radiation from a magnetic dipole and therefore could lead to a vertical magnetic field. On a much longer time scale, the blast wave motion of the heated (conducting) air surrounding the explosion might exclude the earth's field and thus generate a low frequency variation in the vertical component of the magnetic field. It is shown that due to air conductivity and the fact that gamma rays travel with light speed, the Compton currents do not exclude the earth's field. The blast wave motion does exclude the field and the magnitude of the resultant electromagnetic field is estimated. (Author)

AD-281 788 Div. 2
(TISTP/JW) OTS price $11.50

Technical Operations, Inc., Burlington, Mass.
DISPERSAL OF SUPERCOOLED FOG AND STRATUS CLOUDS.
Final rept., Feb 61-31 Mar 62 on Fog and Stratus Cloud Dissipation,
by Alan Eddy and William Vickers. 31 Mar 62, 157p. incl. illus. tables, refs. (Rept. no. TO-B62-17)
(Contract AF 19(604)8049, Proj. 6697)
(AFCRL 62-685) Unclassified report

DESCRIPTORS: *Scattering, *Clouds, Fog, Stratus clouds, Ice, Carbon dioxide, Solidified gases, Water, Turbulence, Seeds.

Results are presented of an experimental study of the dissipation of supercooled fog and stratiform clouds by an airborne dry-ice dispenser. The ultimate purpose is to provide the Air Force with an operational capability of dissipating supercooled clouds by dispensing dry-ice pellets made on board the seeding aircraft and dispensed at will to create holes in the cloud layer of

AD-283 115 Div. 1, 25, 6
(TISTA/VGW) OTS price $8.60

Oxford Corp., Buffalo, N. Y.
WIDE ANGLE PERISCOPE SYSTEM DESIGN AND PROTOTYPE EVALUATION.
July 62, 88p. incl. illus. tables (Rept. no. 6209)
(Contract NOw 61-0348-c)
Unclassified report

DESCRIPTORS: *Periscopes, Cockpits, Optical systems, Aviation safety, Feasibility studies, Curved mirrors, Optical equipment, Design.

A new concept for a wide angle periscope suitable for installation in the cockpit of an aircraft was investigated. The periscope was to have a horizontal view of 180 degrees with a ± 15 degrees vertical view and be capable of rapid closure. The system comprises a series of reflecting elliptical surfaces of revolution arranged about a vertical axis. The observer is located at the center of the lowest surface, and is essentially surrounded by a view of the outside scene having normal intensity. Design studies of the system were made with regard to scaling, surface precision, eye position sensitivity, distortion and focus. Fabrication techniques and materials were examined and two sets of surfaces manufactured to obtain further answers to questions raised or left unanswered by the analytical approach. The result of the design studies and prototype evaluations was to point out the extreme sensitivity to eye position for a system of this size and the need for optically precise surfaces which were unobtainable by the approach used. (Author)

AD-283 118 Div. 1, 6, 25, 28
(TISTM/PCR) OTS price $1.75

Philco Corp., Blue Bell, Pa.
ELECTROCHEMICAL LIGHT MODULATOR.
Final rept. for 1 Feb-1 Oct 61 on Aerospace System Personnel Protection,
by John F. Aitken. Apr 62, 43p. incl. illus. table.
(Contract AF 33(616)7928, Proj. 6301)
(MRL TDR 62-29) Unclassified report

DESCRIPTORS: *Vision, *Modulation, *Electrochemistry, *Modulators, Aviation personnel, Nuclear explosions, Flash burns, Manufacturing methods, Glass, Resistance, Circuits, Lenses, Capacitors, Photoelectric shutters, Copper, Electric currents, Optical analysis, Electronic circuits, Pulse amplifiers, Trigger circuits, Silicon, Rectifiers, Power supplies, Protective coverings, Light.

An electrochemical device was developed to automatically provide vision protection for aircraft personnel during nuclear flashes. The requirements were that it have an optical density of 4 within 50 microsec, clear in 1 sec, and have an open-state transmission of 33% for visible light. In the original cell design, difficulties were encountered with the fabrication of conducting glass plates, contact resistances, and heavily loaded parallel circuits. To eliminate these difficulties, design changes were made; however, completed cells are not entirely satisfactory. All of the specifications, therefore, could not be met. Improvements are still possible in the size and weight of the electronic package, and in the lens plating time. It is concluded that, by placing 5 cells (with series-connected subelements) back-to-back, fabrication difficulties will be reduced and specifications met. (Author)

## 2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-281 704 Div. 2, 1
(TISTP/JW) OTS price $2.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
WIND VARIABILITY ESTIMATES AS A FUNCTION OF AVERAGING INTERVAL,
by Roy L. Lamberth. Aug 62, 26p. incl. illus.
(Technical rept. no. MM-457)
Unclassified report

DESCRIPTORS: *Wind direction indicators, *Weather forecasting, Variable speed drives, Sampling, Analysis of variance, Wind.

The variability with averaging interval of four one-hour periods of wind speed and direction data was studied from data collected at two locations 100 feet apart and 14 feet above ground. The variance of the difference of the wind at the two points was computed by three fundamentally different methods. It is concluded that sampling intervals of the order of five to ten minutes are more effective for predicting winds at a point 100 feet from a sensor than are shorter intervals of 12 seconds to one minute. (Author)

AD-281 705 Div. 2, 12
(TISTP/JW) OTS price $3.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
SURFACE WIND SAMPLING PERIODS FOR UNGUIDED ROCKET IMPACT PREDICTION,
by Henry Rachele. Aug 62, 30p. incl. illus. table, 4 refs. (Technical rept. no. MM-458)
Unclassified report

DESCRIPTORS: *Wind, *Rocket trajectories, Instrumentation, Linear systems, Sampling, Atmospherics, Surfaces, Statistical analysis, Frequency, Measurement.

Present methods used for obtaining wind measurements for application to unguided rockets involve a horizontal separation between the point(s) of wind measurement and the rocket trajectory. This presents a particular problem of how one best measures the wind, including the type of instruments to be used and the amount of data (sampling interval) to be used. The consequence of instrument selection is brought out in a discussion of the Linear Response Function, whereas the effect of using different sampling intervals is based on the study of the variance of wind differences between two points using different sampling periods which showed that sampling periods on the order of 1-5 minutes are needed, and the correlation between paired frequencies of the wind at the two points using cross-correlation techniques which showed that samples on the order of 5-10 minutes are required. The eddy size distribution of the wind samples used is also presented in tabular form. (Author)

AD-281 707 Div. 2
(TISTP/FR) OTS price $9.10

Army Cold Regions Research and Engineering Lab., Hanover, N. H.
RELATIONSHIP BETWEEN FOUR GROUND PATTERNS, STRUCTURE OF THE ACTIVE LAYER, AND TYPE AND DISTRIBUTION OF ICE IN THE PERMAFROST,
by Arturo E. Corte. Feb 62, 1v. incl. illus. tables, refs. (Research rept. no. 88)
Unclassified report

DESCRIPTORS: *Permafrost, *Ice, *Soils, Freezing, Physical properties.

ed. by J. Aarons and S. M. Silverman. Apr 62, 164p. incl. illus. tables, refs. (Rept. no. AFCRL 62-441)

Unclassified report

DESCRIPTORS: *Sun, Solar flares, Magnetic storms, Cosmic rays, Extraterrestrial radio waves, Ionosphere, Aurorae, Electrons, Protons, Neutrons, Moon, Radio waves, Reflection, Polarization, Nuclei, Carbon, Scattering, Spectrographic analysis, Satellite vehicles, Manganese, Cobalt, Radioactive isotopes, Terrestrial magnetism.

A conference on the November 1960 solar-terrestrial events was held at the Air Force Cambridge Research Laboratories, Hanscom Field, Bedford, Massachusetts, February 15 to 17, 1961. Data on solar and geophysical observations and their theoretical interpretations by the scientific staff at AFCRL are presented. The solar-terrestrial events are unique in that they provide information on solar particles of cosmic-ray energies and on geophysical and propagation effects of the cosmic-ray flares. (Author)

AD-282 023 Div. 2, 20
(TISTP/JW) OTS price $1.60

Massachusetts Inst. of Tech., Cambridge.
APPLICATION OF WEATHER RADAR TO FALLOUT PREDICTION.
Quarterly technical rept. no. 16, 1 Dec 61-28 Feb 62,
by Pauline M. Austin. 15 Mar 62, 10p. illus.
(Contract DA 36-039-sc-75030, Proj. 3A99-07-001-01-03)

Unclassified report

DESCRIPTORS: *Radioactive fall-out, *Nuclear explosions, *Precipitation, Meteorology, Radar signals, Meteorological data, Storms, Data processing systems, Instrumentation.

Intensity contour data from several long storms containing widespread light rain or snow were added to the backlog of quantitative data on winter storms. In instrumentation work excellent progress had been made on devices for quantizing the output from the delay-line integrator and for displaying several intensity levels simultaneously. An F-M sweep integrator for use with short pulse on the AN/CPS-9 radar is also progressing well and should be in operation some time during the summer. In addition, an RHI for the SCR-615-B radar is under construction. Investigations of measurement of rainfall over an area are continuing. Excellent results are obtained at close ranges, but in certain types of storms at ranges beyond 40 miles, effects related to the filling of the beam and the height of the radar horizon above the ground become apparent. Computations concerning the dispersion of the radioactive cloud from a 10Kt detonation have been completed for a selected wind field, one in which the wind speeds involved are of average magnitude.

AD-282 050 Div. 2, 25
(TISTP/JW) OTS price $3.60

RAND Corp., Santa Monica, Calif.
EFFECTS OF COSMIC RADIATION ON THE EXTREMELY LOW FREQUENCY PROPERTIES OF THE MESOSPHERE,
by P. A. Goldberg. July 62, 27p. incl. illus. table, 34 refs. (Research memo. no. RM-3230-PR)
(Contract AF 49(638)700, Proj. RAND)

Unclassified report

DESCRIPTORS: *Extremely low frequency, *Ionosphere, *Cosmic ray bursts, Refraction, Radiation effects, Ionization, Electromagnetic effects, Electron diffraction analysis, Atmospherics.

At extremely low frequencies (1 to 3000 cps) relatively slight amounts of ionization can produce notable effects on electromagnetic phenomena in the terrestrial system. Representative atmospheric conditions are examined to find minimum conditions that can produce such strong ELF effects at geophysically quiet periods. Based on analyses of ion production parameters it is found that even for quiet nights, when only cosmic radiation is important for producing ionization in the mesosphere, large refractivities can be produced in this portion of the atmosphere below the ionosphere. For even a minimum electron detachment condition the refractive index of the mesosphere has the large magnitude of 4 at an altitude 75 km. For a more inclusive ion production condition with a maximum detachment factor that collates with VLF observations, strong refractivity effects occur at quite low altitudes; namely 35 km at 1 cps, 50 km at 10 cps, 55 km at 100 cps, and 65 km at 1000 cps. At VLF frequencies (10 KC and above) effective altitudes for the night time lower ionosphere take on values normally assumed. During daytime and active solar periods it is indicated that strong refractivity effects will occur at altitudes below 30 km. (Author)

AD-282 096 Div. 2
(TISTP/FR) OTS price $2.60

California U., Berkeley.
AN ''EFFECTIVE'' STOCHASTIC MODEL FOR INTERPRETING THE CORRELATION BETWEEN THE PRECIPITATION AT TWO STATIONS,
by F. N. David. 31 July 62, 18p. (Scientific rept. no. 1)
(Contract AF 19(604)8051)
(AFCRL 62-495) Unclassified report

DESCRIPTORS: *Precipitation, Raindrops, Storms, Mathematical analysis.

An effective stochastic model as opposed to a dynamic stochastic model is proposed and defined. The correlation between the precipitation at two stations a distance R apart is worked out, in terms of the constants intervening in the model. The model is directly applicable to California data but may easily be altered to be applicable to any region. (Author)

AD-282 097 Div. 2, 15
(TISTP/WH) OTS price $1.60

California U., Berkeley.
PERSISTENCE IN A CHAIN OF MULTIPLE EVENTS WHEN THERE IS SIMPLE DEPENDENCE,
by D. E. Barton, F. N. David, and Evelyn Fix.
31 May 62, 16p. (Scientific rept. no. 3)
(Contract AF 19(604)8051, Proj. 8624)
(AFCRL 62-496) Unclassified report

DESCRIPTORS: *Wind, *Probability, *Series, *Weather forecasting, *Sequences.

The correlation between the day-to-day direction of the wind is studied by means of a stochastic model of 'persistence' in a chain of events. It was found more rewarding to study 'persistence' rather than the actual correlation. New properties of the chain of multiple events are determined. An indication is given of how the theory may be applied to the data of experience. (Author)

AD-282 115 Div. 2
(TISTP/JW) OTS price $8.60

Air Force Cambridge Research Labs., Bedford, Mass.
ATLAS OF MONTHLY MEAN STRATOSPHERE CHARTS.

specific size for particular missions. Experiments are designed, flown, and analyzed to determine what variables, either controllable or uncontrollable, are influencing the experiments and which of these variables must be considered in the design of equipment. The final results indicate that cloud liquid-water content and turbulence are two uncontrollable variables influencing the experiment. The trial range used for controllable variables was higher than the critical minimums sought. The experiments show that a simple emergency dispenser for all aircraft appears feasible for cloud decks less than 1,000 feet thick. A more sophisticated model with a single size pellet-making ability and 300-lb liquid CO2 capacity should be designed for airport duty aircraft. (Author)

AD-281 840 Div. 2
(TISTP/FR) OTS price $2.60

Aerospace Information Div., Washington, D. C.
PHENOMENA IN THE UPPER ATMOSPHERE. REVIEW OF SOVIET LITERATURE.
Monthly rept. no. 26 for June 62.
30 June 62, 25p. incl. illus. 21 refs. (AID rept. no. 62-105)
Unclassified report

DESCRIPTORS: *Sun, *Atmosphere, Solar flares, Sunspots, Solar corona, Magnetic fields, Electrons, Aurorae, Ionosphere, Terrestrial magnetism, Novae, Cosmic rays, Van Allen radiation belt, Storms, Thunderclouds, Space probes, Bibliography.

AD-281 871 Div. 2
(TISTA/SEB) OTS price $7.60

Aerospace Information Div., Washington, D. C.
PHYSICAL PROPERTIES OF PLANETARY ATMOSPHERES REVIEW OF SOVIET LITERATURE.
30 June 62, 68p. incl. 23 refs. (AID rept. no. 62-87)
Unclassified report

DESCRIPTORS: *Planetary atmospheres, Chemical elements, Analysis, Clouds, Energy, Thermionic emission, Optics, Refraction, Light transmission, Scattering, Light, Pressure, Mathematical analysis, Dynamics, USSR, Physical properties, Solar energy, Radiation effects, Theory.

Contents:
Composition of planetary atmospheres
  Chemical and mechanical elements
  Cloud formation
  Mass of the atmosphere
Energy sources of the atmosphere
  Radiation density and radiation flux
  Absorption and emission of radiation
  Experimental check of the transparency coefficient
  Dissociative action of solar radiative energy
  Components of atmospheric energy
Dynamics of the atmosphere
  General conditions of atmospheric movements
  Dry adiabatic processes of closed systems
  Adiabatic processes with water vapor in closed systems
Optical properties of the atmosphere
  Refraction
  Light scattering in the atmosphere

AD-281 878 Div. 2
(TISTP/FR) OTS price $5.60

Cloud Physics Lab., U. of Chicago, Ill.
AIRCRAFT ELECTROSTATIC MEASUREMENT INSTRUMENTATION AND OBSERVATIONS OF CLOUD ELECTRIFICATION.
Final rept.,
by D. R. Fitzgerald and H. R. Byers. 28 Feb 62, 35p. illus. refs.
(Contract AF 19(604)2189, Proj. 8620)
(AFCRL TR 62-805) Unclassified report

DESCRIPTORS: *Thunderclouds, Electrostatic fields, Measurement, Instrumentation, Airborne.

Four electric-field meters were installed on a C-130A aircraft to provide measurements of three components of the cloud electrostatic field vector and the aircraft charge. An analog computer allowed real-time display and recording of these components. This system was used to study electrical charge production in convective clouds as an aid to the understanding of lightning charge centers. (Author)

AD-281 932 Div. 2, 25
(TISTP/TL) OTS price $2.60

Massachusetts Inst. of Tech., Cambridge.
PILOT CALCULATION OF THE FLUX OF ANGULAR MOMENTUM IN A SPIRAL GALAXY.
Scientific rept. no. 5 on Planetary Circulations Project,
by Victor P. Starr and Reginald E. Newell.
15 June 62, 11p. incl. illus. 6 refs.
(Contract AF 19(604)6108, Proj. 8628)
(AFCRL-62-641)
Unclassified report

DESCRIPTORS: *Celestial mechanics, *Galaxy models, *Atmosphere, Gravity, Torque, Moments, Difference equations, Numerical analysis, Integration, Tables.

The radial flow of angular momentum due to the action of purely gravitational torques is estimated for the galaxy M51. The method is based upon some prior work and involves the use of a cartesian finite difference gridwork with the aid of an estimate of the actual mass distribution from photographic evidence. The numerical integration indicates the presence of a marked outward flow of angular momentum which would by itself be of prime importance for the mechanics of the galaxy. (Author)

AD-281 933 Div. 2
(TISTP/FR) OTS price $3.60

Johannes Gutenberg-Universitaet (Germany).
OPTICAL TRANSMISSION OF THE ATMOSPHERE IN GREENLAND (SKY RADIATION AND ITS DEGREE OF POLARIZATION).
Final technical rept., 1 June 61-30 June 62,
by Kurt Bullrich. 30 June 62, 22p. incl. illus. 6 refs.
(Contract DA 91-591-EUC-1718)
Unclassified report

DESCRIPTORS: *Atmosphere, *Sky brightness, Transmission, Polarization, Scattering, Measurement, Aerosols, Greenland.

From June 6 thru June 21, 1961, measurements of the radiation distribution and the degree of polarization in various narrow spectral ranges and over various segments of the sky were made near Camp Century in North Greenland. The photometer used measured sky radiation and polarization in the wave length range from 0.4 to 0.85 mu. (Author)

AD-281 948 Div. 2
(TISTP/FR) OTS price $12.00

Air Force Cambridge Research Labs., Bedford, Mass.
AFCRL STUDIES OF THE NOVEMBER 1960 SOLAR - TERRESTRIAL EVENTS.
Research rept.,

DESCRIPTORS: *Weather forecasting, Mathematical prediction, Barometric pressure, High altitude.

A forecast model proposed by 'Arnason as being capable of producing realistic forecasts of displacement of systems at and below 500 mb was investigated. A prediction equation is applied to test cases at 1000, 850, 700 and 500 mb with various values of the parameter k1. The effect of the value of the parameter on the amount of divergence present in the model is discussed. Root-mean-square errors for 24-hour and 48-hour forecasts with various values of k1 at each level are presented. Optimum values of k1 for the cases tested are selected as 3.5, 2.75 and 0.9 for the levels 850, 700 and 500 mb respectively. It is found that with proper values for k1 the model will provide good forecasts of system movement at each level tested, but as expected, changes in the intensity of systems are not correctly forecast. In all cases values of root-mean-square error of forecasts are less than those obtained by applying the Helmholtz barotropic model. A geostrophic version of the model is also tested and is found to produce results similar to those obtained for the stream-function version except that the geostrophic blow-up of low-latitude high pressure cells is observed. (Author)

AD-282 320 Div. 2
(TISTP/GRW) OTS price $13.00

Naval Postgraduate School, Monterey, Calif.
HEMISPHERIC SOLUTION OF THE OMEGA EQUATION INCLUDING TERRAIN AND SURFACE FRICTIONAL EFFECTS.
Master's thesis,
by Leo C. Clarke and George E. Lawniczak, Jr.
1962, 162p. incl. illus.
Unclassified report

DESCRIPTORS: *Atmosphere, *Barometric pressure, *Shear stresses, Terrain, Friction, Northern Hemisphere, Meteorological data, Programming.

A quasi-geostrophic omega equation for large-scale vertical velocities in the atmosphere is solved at the earth's surface, 850-, 700-, 500-, and 300-mb levels for a grid of 1977 points per level covering the major portion of the Northern Hemisphere. The effects of terrain and surface frictional stress on the vertical velocity at the lower boundary are investigated in some detail and applied at the earth's surface. The three-dimensional integration of the resulting equations excludes areas inside the terrain. The mathematical model is programmed for the Control Data Corporation 1604 digital computer to utilize the operational output of machine-processed data and analyses produced by the Fleet Numerical Weather Facility (FNWF), Monterey, California. The program allows a wide variety of modes of operation and yields a solution for the omega equation in five minutes. (Author)

AD-282 357 Div. 2
(TISTP/FR) OTS price $1.60

Space Sciences Lab., U. of Calif., Berkeley.
DYNAMICS OF THE MAGNETOSPHERE,
by S. H. Ward. 6 Aug 62, 13p. illus. 29 refs.
(Series no. 3, Issue no. 12)
(Contract Nonr-22289)
Unclassified report

DESCRIPTORS: *Magnetic storms, Upper atmosphere, Terrestrial magnetism, Statistical analysis.

The impedance concept, so often utilized in solving problems in electromagnetic theory, is considered as it might apply to the dynamics of the magnetosphere. Geomagnetic microstorms, events usually given the label b.p.s., are utilized in discussing the transfer impedance of the magnetosphere. By this means we illustrate the relationship, in the frequency domain, between an assumed step function change in the solar wind and an observed b.p.s. event. The transfer impedance so deduced is explained in terms of equivalent circuits. The circuit analogies are extended to include a unified explanation of the origin of the micropulsations types pc and pt. Conclusions based on the application of statistical communication theory lead us to deduce possible mechanisms in the magnetosphere for the generation of micropulsation signal and noise. (Author)

AD-282 364 Div. 2
(TISTP/FR) OTS price $6.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
CORRELATION OF D/F ERRORS WITH IONOSPHERIC RADIO PROPAGATION PHENOMENA,
by E. C. Hayden. 7 Mar 62, 57p. incl. illus.
(Technical rept. no. 2)
(Contract AF 30(602)2413, Proj. 4505)
(RADC TDR 62-236) Unclassified report

DESCRIPTORS: *Direction finding, Errors, Ionospheric propagation, High frequency, Bibliography.

The problem of estimating probable reliability or accuracy of specific sets of direction-of-arrival data and the problem of using knowledge of the ionosphere for the correction of such data for use in radio location are considered in the light of proved state-of-the-art techniques. The stated conclusions are that the solution to the first problem is dependent on the specific system involved, that no technique proposed for the solution of either problem has yet been adequately proved, and that further experimental and theoretical work on both areas is required. A brief description is given of some aspects of an experimental program (those aspects with which this contract is directly involved) designed to provide answers to the above questions. (Author)

AD-282 368 Div. 2
(TISTP/FR) OTS price $3.60

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
ABUNDANCES OF ELEMENTS IN STARS AND NEBULAE (THE ABUNDANCE OF CERTAIN ELEMENTS IN THE SOLAR ATMOSPHERE),
by L. H. Aller. June 62, 28p. incl. illus. tables, 28 refs. (Technical note no. 2; Rept. no. 03719-2-T)
(Contract AF 49(638)807)
(AFOSR-3024) Unclassified report

DESCRIPTORS: *Chemical elements, *Solar atmosphere, Abundance, Spectrographic analysis.

The solar abundances of 21 elements (Na, Sc, Cu, Zn, Ga, Ge, Sr, Y, Zr, Nb, Mo, Ru, Rh, Pd, Ag, Cd, In, Sn, Sb, Ba, and Yb) were revised with the aid of new gf-values obtained by C. Corliss of the National Bureau of Standards. Some implications of the new measurements are discussed and it is emphasized that a comprehensive reconsideration of solar abundances should be undertaken, in which ions as well as neutral atoms and a new model solar atmosphere are used. (Author)

1955-1959. PART I. JANUARY-JUNE,
by H. Stuart Muench. May 62, 1v. incl. illus. table, 14 refs. (Air Force Surveys in Geophysics no. 141; AFCRL-62-494)
Unclassified report

Original contains color plates; all ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: *Meteorological charts, *Stratosphere, Meteorology, Northern hemisphere, Space environmental conditions.

This volume is the first of two depicting average conditions in the stratosphere over the northern hemisphere during the period July 1955 to July 1959. Monthly mean charts of contours and isotherms are presented for the 100-mb, 50-mb, and 25-mb levels for each of the 48 months. In addition, four-year composite means are presented for each of the twelve months of the year at each level. The maps clearly show how the monthly mean pattern for a winter month can vary considerably from year to year, whereas the patterns for the summer months vary but little from year to year. (Author)

AD-282 133 Div. 2, 16, 25
(TISTP/JW) OTS price $14.00

California U., Davis.
INVESTIGATION OF ENERGY AND MASS TRANSFERS NEAR THE GROUND INCLUDING THE INFLUENCES OF THE SOIL-PLANT-ATMOSPHERE SYSTEM.
Annual rept. no. 2, 15 Dec 60-14 Dec 61,
by F. A. Brooks, W. O. Pruitt and others.
Feb 62, 190p. incl. illus. tables, refs.
(Contract DA 36-039-sc-80334)
Unclassified report

DESCRIPTORS: *Micrometeorology, *Evapotranspiration, *Soils, Mass energy transfer, Energy, Plants, Heat transfer, Atmosphere, Ecology, Measurement, Moisture.

Results are presented of measurements of the evaporative heat flux at the surface and four meters. The relation of the evapotranspiration to net radiation and its change with distance from the leading edge of an irrigated plot is treated. Results of laboratory experiments of water movement in plants and soils are also discussed.

AD-282 168 Div. 2
(TISTP/FR) OTS price $4.60

St. Louis U., Mo.
S WAVE STUDIES OF EARTHQUAKES OF THE NORTH PACIFIC PART II: ALEUTIAN ISLANDS,
by William Stauder and Agustin Udias. 25 July 62, 18p. illus. tables, 9 refs. (Scientific rept. no. 2)
(Contracts AF 19(604)7399 and AF 19(604)8054, Proj. 8652)
(AFCRL 62-688) Unclassified report

DESCRIPTORS: *Earthquakes, *Seismic waves, Aleutian Islands, Analysis, Polarization.

The polarization of the S wave at stations distributed azimuthally about the source is examined for each of 25 Aleutian Island earthquakes. A combination of data from the first motion of P and from the polarization of S is used to study the focal mechanisms of the earthquakes. This combination of P and S wave data makes possible a good determination of the focal mechanisms in cases where data from the first motion of P alone do not suffice. (Author)

AD-282 242 Div. 2
(TISTP/FR) OTS price $4.60

Kiruna Geophysical Observatory (Sweden).
NOISE EMISSIONS IN THE AUDIO-FREQUENCY RANGE. Final rept.,
by Alv Egeland, Sven Olsen, and Georg Gustafsson.
7 Mar 62, 23p. illus. tables, 32 refs.
(Contract AF 61(514)1314)
(AFCRL 62-381-B) Unclassified report

DESCRIPTORS: *Radio waves, Extremely low frequency, Audiofrequency, Ionosphere, Measurement, Instrumentation.

Broadband noise emissions in the audiofrequency range, as well as the diurnal variation of this background noise were studied. The measurements were carried out near Paksuniemi, about 25 kms east of Kiruna Geophysical Observatory at a place which is almost free from man-made contamination. The nearest 50 cps power lines are more than 7 km from the observation site. Spectrograms of the electromagnetic energy in the frequency region between 10 cps and 10 kc/s have been monitored continuously from November 14, 1961, to January 29, 1962. A description of the receiving equipment, the antennas and methods of measurement is given. (Author)

AD-282 252 Div. 2
(TISTP/FR) OTS price $3.60

Allied Research Associates, Inc., Boston, Mass.
THE MOTION AND PREDICTABILITY OF AMORPHOUS FIELDS OF PRECIPITATION,
by Roland J. Boucher and Raymond Wexler.
1 Dec 61, 32p. incl. illus. tables, 4 refs.
(Scientific rept. no. 8)
(Contract AF 19(604)5204, Proj. 8620)
(AFCRL 62-486) Unclassified report

DESCRIPTORS: *Radar echo areas, Meteorological radar, Precipitation, Motion, Statistical analysis, Weather forecasting.

In forecasting the motion of amorphous precipitation echo fields, it is demonstrated that the doubled average velocity of the centroid of such fields may be useful in extrapolating the echo for very short range automated forecasts. However, an increase in forecast accuracy results by substituting the echo element velocity for that of the centroid. (Author)

AD-282 266 Div. 2
(TISTP/JW) OTS price $3.60

Aeronautical Icing Research Labs., Milan, N. H.
FOG STUDIES AT ARCATA, CALIFORNIA UNDER ''OPERATION PEA SOUP'' 1961.
Interim rept. no. 2, 15 Feb 61-28 Feb 62,
by G. P. Ettenheim, Jr. June 62, 26p. incl. illus. tables, 3 refs. (Technical note no. 571)
(Contract AF 19(604)7210, Proj. 7605)
(AFCRL 62-804) Unclassified report

DESCRIPTORS: *Fog, *Clouds, Meteorological radar, Analysis, Instrumentation, Data processing systems, California.

AD-282 319 Div. 2
(TISTP/FR) OTS price $5.60

Naval Postgraduate School, Monterey, Calif.
AN ANALYSIS OF A DIVERGENT MODEL FOR NUMERICAL FORECASTING.
Master's thesis,
by Harry E. Nicholson. 1962, 46p. incl. illus. tables, 4 refs.
Unclassified report

DESCRIPTORS: *Atmosphere models, *Diffusion, Numerical analysis, Meteorological data, Experimental data.

Since integration of unfiltered baroclinic models has shown numerical instability, tests were made with the simpler model of the homogeneous atmosphere to obtain some knowledge concerning the stability qualities of unfiltered finite difference equations. (Author)

AD-282 399 Div. 2
(TISTP/GRW) OTS price $7.60

Army Engineer Geodesy, Intelligence and Mapping Research and Development Agency, Fort Belvoir, Va.
INTEGRATED MAPPING SYSTEM.
Engineering test rept.,
by Reuben D. Cook. 5 July 62, 64p. incl. illus. tables (Technical rept. no. 7-TR)
Unclassified report

DESCRIPTORS: *Mapping, *Stereoscopic map plotters, Arizona, Photographic recording systems, Geodetic data.

Engineering test and evaluation are made of the Integrated Mapping System, a system for the semi-automatic compilation of maps. Tests were conducted to determine operational characteristics of the system, to investigate resolution and positioning accuracy which might be expected from use of television reimaging to secure planimetric detail, to investigate possible advantages of securing hypsometry through use of dropped lines, and to determine advantages of provision of electronic memory-assistance to the operator during profiling. The report concludes: (a) The Integrated Mapping System is not suitable for use in production-line compilation of maps; (b) resolution and positioning of planimetric detail produced by television reimaging are sufficient for production of orthophotomaps; (c) value of furnishing electronic memory-assistance to an operator is marginal; (d) when implemented by a satisfactory line-drop device the line-drop technique produces satisfactory results; (e) mechanical line-drop control devices are unsatisfactory; (f) individuals experienced in use of conventional compilation equipment can operate the system; and (g) an electronic technician will be needed for periodic maintenance of the system.

AD-282 401 Div. 2, 15
(TISTP/TL) OTS price $1.60

Boeing Scientific Research Labs., Seattle, Wash.
THE MAGNETOSPHERIC WAVE EQUATION IN DIPOLAR COORDINATES,
by William C. Hoffman. June 62, 17p. 4 refs. (Mathematical note no. 259; Document no. D1-82-0181)
Unclassified report

Also available from the author.

DESCRIPTORS: *Upper atmosphere, *Ionosphere, *Van Allen radiation belt, *Electromagnetic fields, *Extraterrestrial radio waves, Differential equations, Terrestrial magnetism, Linear systems, Ionic current, Very low frequency, Vector analysis, Partial differential equations, Tensor analysis, Transformations (Mathematics), Matrix algebra.

Dipolar coordinates alpha equals r/sin square theta, beta equals cos theta/r square, phi equals phi, first introduced by A. Dragt (J. Geophysics Research, 66:1642, 1961) in his treatment of hydromagnetic waves in the Van Allen belts, are applied to the vector wave equation for the electric field in an inhomogeneous magneto-ionic medium. For slowly-varying media, in which magnetic gradients dominate polarization charge gradients, the vector wave equation may be approximated by a system of uncoupled scalar wave equations. The latter reduce to a system of second-order ordinary linear differential equations at large distances. The latter are then solved in the WKB approximation. (Author)

AD-282 418 Div. 2
(TISTA/GEC) OTS price $1.10

Ghana U. (Africa).
THE HEIGHT OF NIGHT TIME F LAYER IRREGULARITIES AT THE EQUATOR.
Technical note no. 1 on Equatorial Study of Irregularities in the Ionosphere,
by G. S. Kent and J. R. Koster. 9 Sep 61, 5p. incl. table.
(Contract AF 61(052)421)
(AFCRL 62-558) Unclassified report

DESCRIPTORS: *Radio waves, *Ionospheric disturbances, *Ionosphere, Satellite vehicles, Radio transmission, Diffraction, Scintillation counters, Radio, Height finding, Scattering, Night sky.

Observations by various workers have shown the existence of large irregularities in the nighttime equatorial F region. These irregularities give rise to equatorial spread-F, severe radio-star scintillation, and the scatter of radio waves. The experiment described was designed to determine the height of the irregularities. The technique adopted consists in the observation, at two separated stations, of the diffraction pattern produced on the ground when the radio transmissions from an earth satellite pass through the irregularities. By measuring the velocity of the pattern over the ground, and relating this to the height and velocity of the satellite, the height of the irregularities is determined. (Author)

AD-282 546 Div. 2
(TISTP/GRW) OTS price $1.60

Institute of Geodesy, Photogrammetry and Cartography, Ohio State U. Research Foundation, Columbus.
DEVELOPMENT OF GRAVITY BOUGUER ANOMALIES OF STATE OF OHIO AND THE ISOSTATIC ANOMALIES IN NORTH ATLANTIC IN FOURIER SERIES,
by Lassi Kivioja. Apr 62, 13p. incl. tables, 1 ref. (Rept. no. 22; Technical paper no. 1058-8)
(Contract AF 19(604)6201)
(AFCRL 62-637) Unclassified report

DESCRIPTORS: *Gravity, *Geodetic data, *Fourier analysis, Series, Ohio, Atlantic Ocean.

Gravity anomalies were developed in Fourier series in two test areas: 2 x 3 deg area in the State of Ohio, and 10 x 35 deg area in the Atlantic. Based on these developments, mean gravity anomalies were estimated for 10 x 10 min and 1 x 1 deg squares. For comparison, also another method was used in which the original values were plotted on a transparent sheet placed over a topographic or bathymetric map, isoanomaly contour lines were drawn based only on the original anomaly values and the topography, and the mean gravity anomalies were estimated for the same squares as in the Fourier series method. The result is that this second manual method has smaller standard errors than the Fourier series method, and that this kind of extrapolation even between two anomaly profiles should not be extended farther than about 4 degrees from a profile. (Author)

AD-282 369 Div. 2
(TISTP/FR) OTS price $4.60

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
ABUNDANCES OF ELEMENTS IN STARS AND NEBULAE (STUDIES OF HYDROGEN-DEFICIENT STARS: I),
by L. H. Aller. June 62, 41p. incl. illus. tables, 25 refs. (Technical note no. 1; Rept. no. 03719-1-T)
(Contract AF 49(638)807)
Unclassified report

DESCRIPTORS: *Stars, Helium, Hydrogen, Atmosphere models, Star models.

To interpret the spectrum of a star composed primarily of helium rather than of hydrogen, it is necessary to construct a model atmosphere which gives the variation of pressure temperature and density with depth. On the assumption that the atmosphere is in hydrostatic equilibrium and that flow of energy takes place by radiation rather than by convection currents, the calculation of an appropriate model is described. The essential boundary condition that the radiative flux is constant with depth can be applied only after temperature and pressure have been calculated for all different depths and the entire radiation field has been calculated. Hence an iterative process has to be applied. Procedures which work for the corresponding problem of a hydrogen atmosphere fail, and one must proceed by trial and error in order to obtain the final solution. (Author)

AD-282 378 Div. 2
(TISTP/GRW) OTS price $2.60

Institute of Geodesy, Photogrammetry and Cartography, Ohio State U. Research Foundation, Columbus.
CORRECTIONS TO GRAVITY FORMULA FROM DIRECT OBSERVATIONS AND ANOMALIES EXPRESSED IN LOWER DEGREE SPHERICAL HARMONICS,
by U. A. Uotila. Apr 62, 24p. incl. illus. tables, 15 refs. (Rept. no. 23; Technical paper no. 1058-9)
(Contract AF 19(604)6201, Proj. 7600)
(AFCRL 62-610) Unclassified report

DESCRIPTORS: *Gravity, *Geodetic data, *Least squares method, Corrections, Harmonic analysis.

The author had at his disposal 11,586 1 deg x 1 deg mean free air anomalies and 8,172 1 deg x 1 deg mean isostatic anomalies, which were determined from surface gravity observations. Using the least-squares solution, he computed corrections to the International Gravity Formula, and he also computed the theoretical gravity formula for the triaxial ellipsoid. He determined the coefficients for lower degree spherical harmonics. These were computed two different ways: (1) using surface gravity anomalies alone, (2) combining surface gravity information and zonal harmonics computed from satellite data. Departures from the International Gravity Formula, and the contributions of the lower degree spherical harmonics to the undulation of the geoid are given in map form. All computations are referred to the Potsdam System, g = 981.27400 gal. (Author)

AD-282 381 Div. 2
(TISTP/GRW) OTS price $5.60

Ionosphere Research Lab., Pennsylvania State U., University Park.
NIGHTTIME ELECTRON DENSITY, HEIGHT PROFILES FROM 300 KC/S POLARIZATION MEASUREMENTS,
by C. H. Stevens. 15 June 62, 49p. incl. illus. tables, 16 refs. (Scientific rept. no. 163)
(Contract AF 19(604)4563, Proj. 8605)
(AFCRL 62-808) Unclassified report

DESCRIPTORS: *Electromagnetic wave reflections, *Ionosphere, *Polarization, Electrons, Density, Low frequency, Atmospheric sounding.

Studies are reported on the polarization of 300 Kc reflections from the ionosphere at vertical incidence. The polarization ellipse was recorded and its characteristics classified according to reflection height and other simultaneous, echoes observed. The observational data are used to construct electron density profiles for the nighttime ionosphere; up to a height of 300 km. Suggestions for improvement of the recording system are included. (Author)

AD-282 382 Div. 2
(TISTP/GRW) OTS price $12.00

Ionosphere Research Lab., Pennsylvania State U., University Park.
NIGHTTIME LOWER IONOSPHERE ELECTRON DENSITY MEASUREMENTS BY RADIO WAVE PROPAGATION TO ASCENDING ROCKETS,
by E. A. Mechtly. 1 May 62, 158p. incl. illus. tables, 63 refs. (Scientific rept. no. 160)
(Contracts DA 36-061-ORD-577 and AF 19(604)4563, Proj. 8605)
(AFCRL-62-800) Unclassified report

DESCRIPTORS: *Radio waves, *Ionosphere, *Wave transmission, Electrons, Density, Medium frequency, Measurement, Telemetering data, Rocket flight, Atmospheric sounding.

Continuous radio waves at a frequency of 512 Kc were radiated from the ground to ascending Jupiter rockets. Receivers in the rockets measured the field strength of the waves in the D and lower E regions of the ionosphere. Telemetered data revealed the effects of the interference of direct and ionospherically reflected waves, of absorption and of changes of wave polarization. Reflection heights and electron density profiles are deduced from the telemetered data. (Author)

AD-282 386 Div. 2, 6
(TISTP/GRW) OTS price $7.60

Pennsylvania State U., University Park.
A RADAR INVESTIGATION OF PRECIPITATION LINES. Master's thesis,
by Eugene Sensenig Harsh. June 62, 63p. incl. illus. tables, 22 refs.
(Sponsored by Air Force Inst. of Tech.)
Unclassified report

DESCRIPTORS: *Meteorological radar, *Precipitation, Pennsylvania, Terrain, Wind.

A study was made of precipitation lines observed by use of a 10-cm radar set located at The Pennsylvania State University. The problem was to determine to what extent the movement of these lines is related to the winds aloft and what effect the topography of central Pennsylvania has on their movement. (Author)

AD-282 392 Div. 2
(TISTP/GRW) OTS price $1.10

Deutscher Wetterdienst, Frankfurt (Germany).
EXPERIMENTS WITH THE MODEL OF THE HOMOGENEOUS ATMOSPHERE,
by W. Edelmann and H. Reiser. 31 Dec 61, 4p.
(Technical note no. 4)
(Contract AF 61(052)373)
(AFCRL 62-809) Unclassified report

that the land and sea breezes diverging from or converging into the peninsula can cause massive lifting of air to the free convection level. (Author)

AD-282 742 Div. 2
(TISTP/FR) OTS price $8.10

Boeing Co., Seattle, Wash.
INFRARED REFLECTION MEASUREMENTS ON CIRRUS CLOUDS.
Final rept.
30 June 62, 81p. incl. illus. tables, 30 refs.
(Rept. no. D2-20981)
(Contract AF 04(695)45)
Unclassified report

DESCRIPTORS: *Cirrus clouds, *Ice fog, Wyoming, Light, Infrared radiation, Reflection, Scattering, Measurement, Ice.

Measurements were made on the infrared and visible reflection properties of cirrus (ice) clouds formed at Old Faithful Geyser. All data have been correlated with meteorological parameters and the solar scattering angle. Changing from 180 to 5 degrees scattering angle caused a 100 times increase in radiance at 2.9 microns. No differences were noted between water drop and ice particle clouds, except for intense specular reflections (the undersun) from ice plate fogs. (Author)

AD-282 744 Div. 2, 20
(TISTP/WH) OTS price $1.60

Boeing Scientific Research Labs., Seattle, Wash.
ON THE DIRECTIVITY OF SOLAR PROTON EMISSIONS,
by John C. Noyes. June 62, 7p. illus. table, 16 refs. (Rept. no. D1-82-0189)
Unclassified report

Also available from the author.

DESCRIPTORS: *Solar flares, *Protons, *Extraterrestrial radio waves.

A hypothesis is advanced that the detection or nondetection of energetic solar protons in the vicinity of the earth following large solar flares and continuum type IV radiation may be due in part to the direction of emission of the protons from the sun. It is hypothesized that the direction of emission of solar protons is the same as the direction of motion of the associated metric wave type IV source, in the general direction of a coronal streamer associated with the solar active region. The streamer may be inclined to the normal to the solar surface. Protons thus directed westward may have a better chance of being detected at the earth than those directed eastward, since in the former case propagation may be facilitated by extended solar magnetic field lines convex westward due to solar rotation. (Author)

AD-282 777 Div. 2
(TISTP/JW) OTS price $1.60

Institute for Advanced Studies, Dublin (Eire).
A MULTI-COMPARTMENT MIXING-TYPE CLOUD CHAMBER FOR SIMULTANEOUS DETERMINATION OF ICE-NUCLEUS CONCENTRATION AT VARIOUS TEMPERATURES.
Final technical rept. no. 2, 1 Dec 60-31 July 62 on Design, Construction, and Testing of a Multicompartment Mixing Cloud Chamber for Simultaneous Determination of Ice-nucleus Concentration at Various Temperatures,
by L. W. Pollak and A. L. Metnieks. July 62, 15p. incl. illus. tables, 1 ref.
(Contract DA 91-591-EUC-1657)
Unclassified report

DESCRIPTORS: *Cloud chambers, *Ice, Temperature, Design, Instrumentation, Crystals, Freezing, Melting, Nuclei.

A cloud chamber for investigating the ice-forming properties of natural and artificial aerosols consisting of three adjacent compartments is described. Each compartment is a mixing-type cloud chamber, each held at a different preselected temperature. The sample to be examined is introduced simultaneously into all compartments and the crystals which form in the compartments, are recorded in a sugar solution. The temperature distribution in the compartments and the composition of the sugar solution are detailed. The connection between the temperature of the sugar solution for melting and growing of ice crystals and for self-crystalisation of the sugar solution and the concentration of the sugar solution is discussed. The measuring procedure is outlined and examples of counts of freezing nuclei in Dublin air are given. (Author)

AD-282 784 Div. 2
(TISTP/JW) OTS price $9.60

Naval Air Station, Norfolk, Va.
ARCTIC FORECAST GUIDE.
Report on Polar Analysis and Forecasting Techniques,
ed. by John M. Mercer. Apr 62, 107p. incl. illus. tables, 12 refs.
(Proj. NWRF 16-0462-058)
Unclassified report

DESCRIPTORS: *Weather forecasting, Climate, Handbooks, Wind, Diurnal variations, Temperature, Pressure, Clouds, Snow, Visibility, Arctic regions.

AD-282 789 Div. 2, 6, 15
(TISTP/WH) OTS price $2.60

Naval Weapons Lab., Dahlgren, Va.
STRENGTH OF GEOMETRIC SOLUTION FOR THE RELATIVE POSITIONS OF BASE STATIONS FROM OBSERVATIONS OF SATELLITES,
by C. J. Cohen and E. C. Hubbard. 15 Aug 62, 19p. incl. illus. (NWL rept. no. 1803)
Unclassified report

DESCRIPTORS: *Satellite vehicles, Tracking, Geodesics, Statistical analysis, Aerial photography, Mapping, Simultaneous equations.

The strength of geometric solutions for the relative positions of a set of base stations using observations of a satellite is examined. The stations are a base to which new stations can be tied relatively easily. Each satellite position is observed from all the base stations. The observations considered are ranges from the stations to satellite positions, range differences to successive satellite positions in each pass, and optical determinations of the directions of the sight lines. It is discovered that the range and range difference methods are indeterminate for coplanar stations. However, for the four station configuration evaluated the small deviations from coplanarity sufficed to give rather good strength. The four stations correspond to a Project ANNA ''calibration'' configuration and are roughly in a square 750 kilometers on a side. The standard deviations for them under our assumptions are found to be under 19 centimeters from range observations, 14 meters from range difference observations, and 4 meters from optical observations. Terrestrial surveys give standard deviations of 5 meters. For various reasons, the errors from range and range difference observations should be increased perhaps an order of magnitude. (Author)

# Division 2 - ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-282 609 Div. 2, 20
(TISTP/TL) OTS price $4.60

RAND Corp., Santa Monica, Calif.
THE RESPONSE TIME OF THE LOWER IONOSPHERE TO A PULSE OF IONIZATION,
by R. E. LeLevier. Aug 62, 35p. incl. illus. table, 9 refs. (Memo. RM-3204-PR)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: *Ionosphere, *Relaxation time, *Radiofrequency pulses, *Ionization, Detection, High altitude, Nuclear explosions, Electrons, Measurement, X-rays, Air, Chemical reaction, Oxygen, Nitrogen, Oxides, Recombination reactions.

A theoretical discussion of the response of the ionosphere to a pulse of ionization is presented. It is known that both the local air chemistry and the level of ambient ionization affect the lifetime of free electrons in the ionosphere. The model for the air chemistry used here assumes a standard air mixture for which O2 is the dominant negative ion. Day and night environments are discussed. For illustrative purposes, we consider the recovery characteristics of X-ray induced ionization from high altitude nuclear explosions. A suggestion is made for using a low yield, high altitude nuclear explosion as an X-ray source of known characteristics. This would permit the factoring of the properties of the ionosphere from those of the source. (Author)

AD-282 622 Div. 2, 15, 24
(TISTA/VGW) OTS price $6.60

Wesleyan U., Middletown, Conn.
INVESTIGATIONS ON PHOTOGRAPHIC ASTROMETRIC TECHNIQUE,
by Heinrich Eichhorn and Carol Ann Williams. 30 May 62, 60p. incl. illus. tables, 1 ref.
(Scientific rept. no. 1)
(Contract AF 19(604)7330)
(ESD TDR 62-204) Unclassified report

DESCRIPTORS: *Astronomical cameras, *Satellite vehicles, *Optical images, *Projective geometry, Photographic recording systems, Mathematical analysis, Errors, Position finding, Photographic analysis.

The formulae for the computation of cylindrical standard coordinates from right ascension and declination as well as from position angle and distance, and their inversions, are developed. The formulae for the transformation of cylindrical standard coordinates from one tangential circle to another are established. (Author)

AD-282 623 Div. 2, 24
(TISTA/VGW) OTS price $1.60

Wesleyan U., Middletown, Conn.
ASTROMETRIC INVESTIGATION OF A BAKER-NUNN CAMERA.
Final scientific rept.,
by Heinrich Eichhorn. 25 July 62, 18p. incl. tables.
(Contract AF 19(604)7330)
(ESD TDR 62-206) Unclassified report

DESCRIPTORS: *Astronomical cameras, *Satellite vehicles, *Photographic recording systems, Stars, Mapping, Errors, Measurement, Photographic emulsions, Distortion, Projective geometry, Photographic analysis, Position finding, Optical images.

The images of 1547 stars from the ''Bonner Durchmusterung'' which appear on a film taken with a Baker-Nunn camera were measured on a Mann two-screw measuring machine in 22 sittings, extending over a period of more than 100 days, during which time the film was left in the measuring machine. An attempt was made to check the creeping of the film with respect to the measuring machine, by frequently measuring four crosses which were scratched into the emulsion near the edges. Whatever creeping of the film occurs can fairly satisfactorily be represented by an affine transformation. More than four fiducial marks would have to be measured in order to check the film creeping during the measurements more accurately. By selecting the 823 AGK2 stars in the frame, and using them as reference stars, the systematic errors of the positions which depend on magnitude and color were established. The accuracy of a star position obtained from a Baker-Nunn film was obtained. (Author)

AD-282 645 Div. 2
(TISTP/FR) OTS price $2.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
METEOROLOGICAL ROCKET THERMOMETRY,
by George Q. Clark and John G. McCoy. Aug 62, 22p. incl. illus. 8 refs. (Technical rept. no. MM-460)
Unclassified report

DESCRIPTORS: *Atmospheric sounding, *Thermistors, Temperature, Instrumentation, Oscillation, Sounding rockets.

The development of direct thermometry between 70,000 and 200,000 feet using sounding rockets has presented the researcher with a new and valuable tool for studying the upper atmosphere. This paper presents the development of nose cone Gamma, a temperature sensor-telemetry system designed to be carried aloft by the Arcas rocket and utilize a parachute descent. With the initiation of regular rocket soundings, periodic fluctuations were noted on the temperature recorder traces as the instrument approached and passed the 100,000- to 70,000-foot layer. Tests have been underway since January 1962 in an effort to explain these fluctuations, and current evidence indicates that they are a result of heat flow associated with oscillations of the instrument package on its parachute as it passes through this layer. (Author)

AD-282 668 Div. 2
(TISTP/FR) OTS price $1.60

Hawaii Inst. of Geophysics, Honolulu.
DIURNAL VARIATION OF SUMMER RAINFALL OVER MALAYA,
by C. S. Ramage. June 62, 11p. incl. illus. 10 refs. (Scientific rept. no. 3; Rept. no. 20)
(Contract AF 19(604)6156, Proj. 6698)
(AFCRL 62-603) Unclassified report

DESCRIPTORS: *Malaya, *Precipitation, Diurnal variations, Sea breeze, Terrain, Climate.

Throughout the summer, Malaya is overlain by a warm, moist, conditionally unstable equatorial maritime airmass. Mean rainfall patterns of the typical summer month of August cannot be explained simply in terms of orography acting on the prevailing low-level southwesterlies; neither can afternoon convectional heating be directly related to the peninsula's wide variety of diurnal rainfall variations. Five different diurnal rainfall patterns are identified and shown to derive from interactions among the southwesterlies (synoptic wind), local land, sea, anabatic and katabatic winds and the topography. Computations based on pilot balloon data indicate

Bottom-mounted, pressure-sensitive, ocean wave gages were first installed on the coast of Barbados, West Indies, in 1954. This and subsequent installations were in intermittent operation through 1960. Pressure and microseismic data were obtained in digital form from these installations and subjected to a power spectrum analysis by the Tukey method. Comparisons of sequences of simultaneous ocean-wave spectra and microseism spectra show a 2-to-1 relation in the period of the waves, which is consistent with the Longuet-Higgins theory of microseism generations. Twenty-minute recordings of wave data were made at intervals of six hours. From these recordings power spectra were computed for correlation with North Atlantic winter storms and with hurricanes. Using an array of three wave gages, cross-correlation methods were used to obtain the direction of propagation of the waves across the array. Directions thus obtained during the passage of one hurricane, taking into account the travel time to storm fetch areas, indicate the fetch area to be in the leading edge of the hurricane circulations. (Author)

AD-282 956 Div. 2
(TISTP/GRW) OTS price $4.60

Institute of Geodesy, Photogrammetry and Cartography, Ohio State U. Research Foundation, Columbus.
CORRELATION COEFFICIENTS AND THEIR USE IN THE PREDICTION OF MEAN ANOMALIES,
by Richard Rapp. Apr 62, 38p. incl. illus. tables, 5 refs. (Rept. no. 20; Technical paper no. 1058-6)
(Contract AF 19(604)6201, Proj. 7600)
(AFCRL 62-635) Unclassified report

DESCRIPTORS: *Gravity, *Geodetic data, *Statistical functions, Tables, Corrections.

The correlation of point anomalies with the separation between them was investigated by means of the correlation coefficient. Correlation curves for free air anomalies were established in Ohio and Finland, and for Bouguer anomalies in Ohio alone. The individual curves showed a wide variation, but the curve obtained by meaning the values of a particular correlation coefficient from the individual curves gave a reasonably smooth curve that turned negative at 107 km in Ohio and 147 in Finland. Various equations were applied to these mean curves to find an analytical representation. A satisfactory representation was found from a third order polynomial representation. Tests of the prediction formulas for free air anomalies were carried out using circles of 20 and 40 km in radius. An accuracy analysis was made by comparing the predicted mean anomaly with a true mean anomaly. Based on 14 points in Ohio a mean error of one prediction was ±4 mgals and on 15 points in Finland was ±3 mgals (for R=40 km). In both cases this was an increase in the accuracy of mean anomaly above that if the mean anomaly was simply taken as the point anomaly at the center of the circle. (Author)

AD-282 957 Div. 2
(TISTP/GRW) OTS price $5.60

Institute of Geodesy, Photogrammetry and Cartography, Ohio State U. Research Foundation, Columbus.
STUDIES ON THE ACCURACY OF THE COMPUTATION OF GRAVITY IN HIGH ELEVATIONS,
by Helmut Moritz. Apr 62, 47p. incl. illus, table, 11 refs. (Rept. no. 21; Technical paper no. 1058-7)
(Contract AF 19(604)6201, Proj. 7600)
(AFCRL 62-636) Unclassified report

DESCRIPTORS: *Gravity, *Geodetic data, *Statistical functions, Corrections.

The study of gravity in high elevations gained importance during the last years. It is necessary, especially in connection with checking airborne gravimetric surveys, not only to compute these gravity values from gravity measured on the earth's surface, but also to know the accuracy obtainable. A general theory of accuracy of these computations is sketched and numerical values given. The central conception is the covariance function which was introduced into gravimetry. After the theoretical foundations are summarized, some detailed investigations concerning different computational methods are given. (Author)

AD-282 988 Div. 2
(TISTP/GRW) OTS price $4.60

Texas A. and M. Coll., College Station.
OCEANOGRAPHY AND METEOROLOGY OF THE GULF OF MEXICO.
Annual rept., 1 May 61-30 Apr 62,
by Hugh J. McLellan. 1 July 62, 40p. incl. illus. tables, refs. (Reference no. 62-14A)
(Contract Nonr-211904, Proj. NR 083-036)
Unclassified report

DESCRIPTORS: *Oceanography, *Meteorology, *Gulf of Mexico, Scientific research.

Contents:
Investigations of the Yucatan current
Gross air-sea interactions
A survey of the Gulf of Mexico
Water temperatures in the Northwest Gulf of Mexico
Investigations on micro-scale energy exchange between sea and air
Seismic refraction studies
Contouring temperature recorder
Gravity measurements with LaCoste-Romberg surface-ship meter S-9
Environment studies off Panama City, Florida
Geology and geochemistry
  Investigations into the association of certain metals with sedimentary particles
  Resistance of recent marine sediments to solution
Chemical oceanography and geochemistry
  Isolation and characterization of organic matter in sea water
  Liquid scintillation counting for radio carbon dating

AD-282 989 Div. 2
(TISTP/FR) OTS price $5.60

Lasham Gliding Center (Gt. Brit.).
FLIGHT MEASUREMENTS OF ISOLATED THERMALS.
Final rept., 1 Mar 60-31 July 62,
by Betsy Woodward. 1 Aug 62, 52p. incl. illus. tables.
(Contract DA 91-591-EUC-1707)
Unclassified report

DESCRIPTORS: *Convection, Analysis, Gliders, Meteorological data, Measurement.

A glider was used to study atmospheric thermals. Traverses were made through individual thermals while readings of airspeed, rate of climb, attitude, time, altitude, dry bulb temperature and wet bulb depression were recorded on cine film. From these readings a cross-section of velocities, temperature and moisture content was obtained. The object of the research was to obtain an idea of the magnitude of the above quantities, to evaluate the aircraft and techniques used and compare, if possible, the observed values with those predicted by various models, notably the isolated thermal model. (Author)

# Division 2 - ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-282 815 Div. 2
(TISTP/FR) OTS price $7.60

Washington U., Seattle.
DETAILED ANALYSES OF SELECTED PACIFIC STORMS BASED ON CONTINUOUS RADAR RECORDS AND SHORT-INTERVAL SERIAL ASCENTS. VOLUME IV. CASE OF MARCH 8-10, 1961,
by Carl W. Kreitzberg. Apr 62, 72p. incl. illus. tables, 2 refs. (Technical rept. no. 2)
(Contract AF 19(604)5192, Proj. 8641)
(ARCRL 62-448) Unclassified report

DESCRIPTORS: *Storms, Pacific Ocean, Washington, Radar analysis, Meteorological radar, Meteorological charts, Meteorological data.

Extensive data and a brief discussion pertaining to two occluded fronts which passed Seattle on March 8 and 10, 1961 are given. The data include: (1) serial ascent radiosonde data, both listed and plotted, (2) radar records from the continuously recording 1.87 cm vertically-directed radar, (3) time section, (4) synoptic surface and constant pressure analyses, (5) hourly surface charts, (6) barograph and temperature traces, and (7) pilot reports. The first storm is notable for the lack of warm frontal structure and the part played by evaporation in the modification and propagation of the frontal zone. The second storm exhibited an occluded frontal structure up to 350 mb. Such a situation is unusual, but the data clearly indicate the passage of a sharp boundary between warm and cold advection regions at Seattle while the warm sector air mass remained south of Oregon. (Author)

AD-282 889 Div. 2, 24
(TISTP/GRW) OTS price $8.60

Army Engineer Geodesy, Intelligence and Mapping Research and Development Agency, Fort Belvoir, Va.
PROTOTYPE STEREOMAT SYSTEM.
Rept. for May 59-Dec 60 on Automatic Map Compilation,
by Kent T. Yoritomo. 8 Mar 62, 84p. incl. illus. tables (Technical rept. no. 4-TR)
Unclassified report

DESCRIPTORS: *Mapping, *Stereoscopic map plotters, *Aerial photography, Tests, Automatic, Photographic equipment.

This analysis covers the engineering test and evaluation of the prototype Stereomat, an instrument for the automatic orienting, contouring, and profiling of a stereophotogrammetric model. The Stereomat consists of electronic scanning, correlating, and switching units added to a double-projection stereoplotter for the point-by-point automatic determination of pattern match in a projected stereomodel. The analysis concludes that: (a) The Stereomat is a significant achievement in the automation of the stereoplotting process which has firmly established the feasibility of automatic mapping, (b) The speed and accuracy of relative orientation are comparable to the speed and accuracy of manual operation, (c) Contouring with the Stereomat is almost as accurate as contouring manually and is twice as fast, (d) The accuracy of profiles is slightly less than that of contours, (e) A maximum slope limitation of 26 deg exists for both profiling and contouring, (f) A minimum slope limitation of 3 deg exists for contouring, (g) Dense woodland constitutes problems in contouring, (h) The Stereomat is an easy instrument to operate for individuals experienced with conventional stereocompilation, (i) Operational maintenance of the equipment is relatively easy and is required infrequently, and (j) Orthophotographic output is not feasible with this design because of the low signal-to-noise ratio in the video. (Author)

AD-282 905 Div. 2
(TISTP/FR) OTS price $8.60

Army Ordnance Missile Command, Redstone Arsenal, Huntsville, Ala.
SOME FEATURES OF AIR DENSITY PROFILES UP TO THE MIDDLE STRATOSPHERE,
by Werner H. Alfuth. 10 Oct 61, 92p. incl. illus. tables, 33 refs. (Rept. no. RR-TR-61-4)
Unclassified report

DESCRIPTORS: *Atmosphere models, *Atmosphere, Density, Periodic variations, Statistical analysis, Bahama Islands, Japan, Minnesota, Florida, Alaska.

Per cent deviations of air density from the ARDC Model Atmosphere 1956 are presented for the following locations: Grand Bahama Island, West Indies; Patrick AFB, Florida; Tokyo-Haneda, Japan; International Falls, Minnesota; and Fairbanks, Alaska. Since frequency distributions of air density are often not normal, a mere presentation of formally computed statistics, such as, means and standard deviations has been omitted. Rather the levels of 0.15 per cent, 50 per cent, and 99.85 per cent cumulative percentage frequency were selected to represent median and 'extreme' conditions. The latitudinal and seasonal variations of air density in the different altitude layers are discussed. A separate section has been added under the heading 'Conclusions' to provide a summary of the essential findings. (Author)

AD-282 948 Div. 2
(TISTP/FR) OTS price $9.60

Marine Lab., U. of Miami, Coral Gables, Fla.
A REPORT OF DATA OBTAINED IN FLORIDA STRAITS AND OFF THE WEST COAST OF FLORIDA - JULY - DECEMBER 1961.
June 62, 108p. incl. illus. tables (Rept. no. 62-6; Rept. no. ML 62179)
(Contract Nonr-84001)
Unclassified report

DESCRIPTORS: *Oceanographic data, Florida Straits, Atlantic Ocean, Gulf of Mexico.

The data presented were collected during the latter half of 1961 on six cruises with the R/V GERDA and six cruises with the M/V GREEN SEAS in Florida Straits and the eastern part of the Gulf of Mexico. The data were obtained for studies of the hydrographic conditions prevailing in Florida Straits and adjacent waters, with particular regard to the kinematics of the water movements and also to the physical environment of the shrimp population inhabiting the region of the Tortugas Shelf. (Author)

AD-282 952 Div. 2
(TISTP/FR) OTS price $4.60

Naval Research Lab., Washington, D. C.
SPECTRA OF OCEAN WAVES AND MICROSEISMS AS RELATED TO STORMS AT SEA,
Final rept.,
by J. E. Dinger. 23 July 62, 42p. incl. illus. table, 20 refs. (NRL rept. no. 5804)
Unclassified report

DESCRIPTORS: *Ocean waves, *Hurricanes, Seismic waves, Statistical analysis, Analog-to-digital converters.

line on the opposite side of the river from the canyon wall being cross-sectioned. The base line was approximately at right angles to the cross-section line. One transit was located on the cross-section line, and one on either side of the line being cross-sectioned. A program is given which will compute the horizontal and vertical distances to each cross-section point from the center transit. All three transits are assumed to have the same H. I. for any one set of data. (Author)

AD-283 055 Div. 2
(TISTP/GRW) OTS price $5.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
MOLECULAR OPTICAL THICKNESS OF THE ATMOSPHERES OF MARS AND VENUS,
by K. L. Coulson and M. Lotman. July 62, 56p. incl. illus. tables, 17 refs. (Rept. no. R62SD71)
Unclassified report

DESCRIPTORS: *Mars, *Venus, *Planetary atmospheres, Optical analysis, Solar energy, Scattering, Molecular spectroscopy.

The volume scattering coefficient and optical thickness for molecular scattering of sunlight in several different models of the atmospheres of Mars and Venus are presented. The computations are based on Rayleigh's well-known scattering law. Data are given for eight different wavelengths from 2500A to 10,000A, as a function of altitude above the planetary surface. Fractional transmission of direct solar radiation is then computed for selected cases. Comparison of results with similar data for Earth's atmosphere shows that light scattering techniques are applicable up to higher altitudes in the atmospheres of both Mars and Venus than in Earth's atmosphere. Under the assumption that a normal optical thickness of 0.001 represents a lower limit for practical application, it is found that light scattering techniques can yield useful results up to altitudes of 90km to 100km on both Mars and Venus. The corresponding altitude for Earth's atmosphere is less than 60km. (Author)

AD-283 092 Div. 2
(TISTP/GRW) OTS price $1.60

Hamburger Sternwarte (Germany)
THE IONISATION IN COMETS,
by K. Wurm. 1 July 62, 17p. incl. illus. 9 refs.
(Technical note no. 1)
(Contract AF 61(052)583)
(AFCRL 62-834) Unclassified report

DESCRIPTORS: *Comets, *Ionization, Sources, Nucleons.

Arguments are given to support the view that the process of ionization in comets is intrinsic to the cometary atmosphere itself. The ionization happens within a very limited region in front of the nucleus and the ions are expelled only within a narrow cone directed to the Sun in the form of narrow rays. (Author)

## 3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-282 406 Div. 3
(TISTB/SAT) OTS price $1.10

Hazleton Labs., Inc., Falls Church, Va.
(No title).
Progress rept. no. 25.
1 July 62, 5p.
(Contract DA 18-108-405-cml-826)
Unclassified report

DESCRIPTORS: *Chemical warfare agents, Dosage, Skin, Penetration, Laboratory animals.

A schedule is presented on the skin screening tests of 33 CS and 50 EA type compounds. Preclinical toxicology studies are projected on EA 2545, EA 3164, EA 3167, and EA 3186.

## 4. CHEMISTRY

AD-281 892 Div. 4, 25
(TISTM/REB) OTS price $3.60

Monsanto Research Corp., Dayton, Ohio.
ORGANIC SEMICONDUCTORS.
Semiannual scientific rept. no. 1, May-Dec 61, by E. R. Biehl, G. F. Deebel and others. 30 Dec 61, 32p. incl. illus. tables, 15 refs.
(Contract AF 19(604)8497)
(AFCRL 62-245) Unclassified report

DESCRIPTORS: *Semiconductors, *Organic compounds, *Anthracenes, *Benzenes, *Polycyclic compounds, *Triazines, *Complex compounds, *Quinones, Purification, Single crystals, Growth, Polymers, Iodine, Materials, Synthesis.

The synthesis, purification and single crystal growth of coronene, perylene/iodine complex and chloranil/durenediamine complex are described. The usual purification methods of organic chemistry, viz., chromatography, crystallization and vacuum sublimation, have been employed. Attempted analytical methods for determination of impurities in the above compounds are described. The polymer of 2,4,6-tricyano-s-triazine was prepared and shown to be a semiconductor. (Author)

AD-281 904 Div. 4
(TISTM/REB) OTS price $16.50

Uppsala U. (Sweden).
INORGANIC ADDUCT MOLECULES OF OXO-COMPOUNDS.
Technical final rept., 1 Jan 58-30 June 62, by Ingvar Lindqvist. 30 June 62, 256p. incl. illus.
(Contract AF 61(052)43)
Unclassified report

DESCRIPTORS: *Inorganic substances, *Complex compounds, *Molecules, Chemical reactions, Chemical bonds, Theory, Crystals.

Contents:
Conditions for adduct molecule formation
Characteristic coordination numbers
Structural evidence concerning donor molecules
Adducts with donor molecules containing the group (=C=O)
Adducts with donor molecules containing the group (---As=O)
Adducts with Bronsted acids
Ternary adducts with carboxylic acids
Other ternary adducts
Adduct molecules in the liquid state and in solutions
Affinity studies
Structural data
Charge distribution
Decomposition of adduct molecules
Catalytic activity of acceptor molecules
Theory for donor acceptor interaction with oxo-compounds
Donor-acceptor interaction. Influence on the donor and acceptor molecules
Bond length differences

# Division 2 - ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-283 002 Div. 2
(TISTP/GRW) OTS price $1.10

Aerospace Information Div., Washington, D. C.
LUNAR SURFACE FORMATIONS,
by A. M. Benevolenskiy. 22 Aug 62, 2p. (AID rept. no. 62-122; Trans. of Role of Cumulative Processes in the Formation of Lunar Craters, Byulleten', no. 30 (37) pp. 20-27, 1962. (S/556/62/000/030))
Unclassified report

DESCRIPTORS: *Moon, *Extraterrestrial geography, Terrain, Simulation, Test methods.

A simple method of modeling, utilizing the cumulation principle, has been successfully employed to reproduce lunar ring formations. The method consists in the dropping of solid bodies (pieces of metal, stone, slag) onto a viscous surface (tar, cement, gypsum) at the moment of hardening or setting. A drop striking the still liquid surface forms a hole into which the liquid rushes. The collision of liquid particles filling the hole causes a small cumulative droplet to be ejected upward at high kinetic energy to a considerable height. Tests conducted under normal atmospheric pressure (760 mm Hg) and in a rarefied atmosphere (300 mm Hg) yielded positive results. Solid models of typical lunar ring formations with surrounding wall, steep internal and gentle external slopes, concave bottom, central peak lower than the surrounding wall, rays, clefts, etc. were obtained. The dimensions of the cirque models are directly proportional to the magnitudes of the cumulative effects which, in turn, are determined by the velocity and mass of the solid bodies incident on the hardening medium. (Author)

AD-283 021 Div. 2
(TISTP/GRW) OTS price $3.60

Intermountain Weather, Inc., Salt Lake City, Utah.
SPACIAL VARIATIONS OF VARIOUS METEOROLOGICAL PARAMETERS,
by J. Vern Hales. May 62, 28p. incl. illus. tables, 11 refs. (Scientific rept. no. 4)
(Contract AF 19(604)7333, Proj. 8624)
Unclassified report

DESCRIPTORS: *Meteorological data, *Statistical analysis, Texas, Tables.

The spacial variations between four stations located within 18 miles of each other (San Antonio International Airport, Brooks AFB, Kelly AFB, and Randolph AFB) were computed on the basis of the 1800 CST surface observations for the ten year period from February 1948 through January 1958. The dependence of the parameter variations on the four station mean dew point temperature was studied for the various station combinations. The ceiling height, dew point temperature, wind speed, and dew point spread variations showed a high correlation with the four station mean dew point temperature. Graphs were constructed which showed the seasonal trend of the parameter variations. The wind speed, wind direction, and equivalent potential temperature variations indicate a seasonal trend, with the summer months having the highest variations. (Author)

AD-283 032 Div. 2
(TISTP/GRW) OTS price $7.60

McGill U. (Canada).
CLOUD AMOUNT AND TYPE OVER THE ARCTIC,
by E. Vowinckel. June 62, 27p. illus. tables, 13 refs. (Publication in Meteorology no. 51; Scientific rept. no. 4)
(Contract AF 19(604)7415, Proj. 8623)
(AFCRL 62-663) Unclassified report

DESCRIPTORS: *Clouds, *Arctic regions, Meteorological charts, Classification, Periodic variations.

Cloud conditions in the Arctic regions north of 65 N are evaluated. As more observations are available than when previous cloud maps were constructed, it seemed that a new attempt at cloud mapping, on a monthly basis, would be justified. It proved impossible to use a uniform period of observation for the whole area, especially for the Asian Sector. The data are most recent for the American Sector, oldest for Eurasia. The material was insufficient to permit monthly evaluations of cloud types, so the results were given for seasons. For cloud amount, monthly maps were constructed and grid point values tabulated. Latitudinal means of cloudiness show that there is high variability between seasons in the north, and rather stable conditions in the south. Only during a short transition period in May and again in October is there little difference in the average cloud amount over the whole arctic sector. The main regional types of cloudiness in the Arctic are discussed. These are: Norwegian Sea Type, East Siberian Type, Canadian, and Polar Ocean Type. The seasonal pattern (winter-summer) of cloud amount and type is described and explained, for the arctic area. (Author)

AD-283 035 Div. 2
(TISTP/FR) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DIVISION 3. RADIO PHYSICS.
Quarterly progress rept., 1 Apr-30 June 62.
16 July 62, 10p.
(Contract AF 19(628)500)
(AFESD TDR 62-116) Unclassified report

DESCRIPTORS: *Scientific research, Sun, Radar analysis, Plasma physics, Meteors, Radio waves, Reflection, Scattering, Ionosphere, Ionospheric propagation, Moon, Venus, Terrestrial magnetism, Electromagnetic waves, Extremely low frequency, Radar signals, Detection, Electric filters, Low frequency, Radar antennas, L band.

The research and development efforts of Division 3 for the period 1 April through 30 June 1962 in radio physics, communications, and space surveillance techniques are summarized. Groups 34 and 36 also contribute to the Bagatelle Project Report. A substantial portion of the Division's activities is devoted to the Re-entry Physics and PRESS Programs, which are recorded in a Semi-annual Technical Summary Report to ARPA. (Author)

AD-283 046 Div. 2
(TISTP/FR) OTS price $2.60

Bureau of Reclamation, Denver, Colo.
REDUCTION OF TRIANGULATION CROSS SECTION FIELD NOTES FOR GLEN CANYON.
Report on Electronic Computer Program Description no. C-102.
June 60, 29p. incl. illus.
Unclassified report

DESCRIPTORS: *Civil engineering, Dams, Construction, Terrain, Configuration, Trigonometry, Digital computers, Programming.

Glen Canyon Dam is located in a reach of the Colorado River where the canyon walls are nearly vertical. It was found that the most practical way of obtaining accurate data for cross sections was to paint marks on the canyon walls and to sight on those marks with transits located on base lines established on the opposite side of the river. Three transits were located on a base

Fluorescence, Luminescence, Absorption, Solids, Organic compounds, Acids, Crystals, Growth, Ultraviolet spectroscopy, Synthesis, Materials.

Rare earth chelates were synthesized and investigated for fluorescence at room and at liquid N temperature in the pure state and dissolved in liquid and plastic hosts. Fluorescence was observed in the case of Eu(3+) and Sm(3+) for both tris benzoyl acetonate dihydrate and the tris dibenzoyl methide. No fluorescence was observed in the chelates of Nd(3+), Tm(3+), Yb(3+) using the above ligands. Specific absorption coefficient measurements of the complexing agents were extremely high. Work done on the growth of single crystal solid solutions of chelates in organic crystals revealed the problem of solubility since doping levels obtained were very low. X-ray analysis of crystal structure is being used to aid in solving this problem. Nd doped in porous Vycor showed fluorescence. (Author)

AD-282 397 Div. 4
(TISTM/ODN) OTS price $2.60

Inorganic Research Lab., Western Reserve U., Cleveland, Ohio.
THE DIFFERENTIAL THERMAL ANALYSIS OF CYANO-TRANSITION METAL COMPLEXES,
by Arthur F. Greene, Jr. and Mark M. Chamberlain. 10 Aug 62, 26p. incl. illus. tables, 23 refs. (Technical rept. no. 3)
(Contract Nonr-143907, Proj. NR 052-419)
Unclassified report

DESCRIPTORS: *Complex compounds, *Cyano radicals, *Transition elements, *Nitroso radicals, *Decomposition, Cyanogen, Cobalt compounds, Gases, Ferrates, Cyanides, Heat, Lithium compounds, Dyes, Calcium compounds, Barium compounds, Nickelates, Hydroxides, Chromates, Vanadates, Oxidation-reduction reactions, Analysis, Ammonium radicals, Nitrates, Silver compounds, Potassium compounds, Dichromates, Sodium compounds, Molybdates.

A variety of cyano and mixed cyano-nitrosyl transition metal complexes have been subjected to differential thermal analysis and to study by a technique termed 'dynamic gas evolution.' Most of the complexes were of Fe in either the +2 or +3 oxidation states, but a few analogous Co, Ni, V, Cr, and Mo compounds were also examined. The hexacyano complexes all decomposed to evolve cyanogen--the Fe (II) and Co (III) complexes at about 600 C and the Fe (III) complexes at about 300 C. This decomposition temperature was associated with the relative ease of reduction of the metal ion, since cyanogen evolution can occur only as the result of a redox reaction. The mixed cyano-nitrosyl complexes consistently decomposed to lose first NO (or other, unidentified gases) and then, at higher temperatures, cyanogen. Evolution of NO implies an initial oxidation and then a reduction as the cyanogen is formed. Weight loss determinations and elemental analysis of the products indicate, but do not demonstrate conclusively, the stoichiometry of the DTA products. (Author)

AD-282 433 Div. 4, 25, 17
(TISTM/EJH) OTS price $13.00

Illinois Inst. of Tech., Chicago.
THE THERMODYNAMIC PROPERTIES OF THE SYSTEMS Nb-H, V-H AND Ta-H.
Doctoral thesis,
by Ewald Veleckis. Jan 60, 174p. incl. illus. tables, 39 refs.
(Contract AF 49(638)346)
(AFOSR-1107)
Unclassified report

DESCRIPTORS: *Niobium, *Vanadium, *Tantalum, *Hydrogen, *Solutions, Thermodynamics, High temperature research, Solubility, Solids, Pressure, Gases, Transition elements, Atoms, Lattices, Theory, Tables, Phase studies.

The equilibrium pressure method was employed to determine the solubility of H in Group VB metals in the temperature range 250 to 650 C, and for H pressures extending up to one atmosphere. Only a single solid solution phase was found throughout the experimentally investigated regions. In all three systems, however, the shape of the low-temperature isotherms clearly indicated the existence of two-phase immiscibility intervals. For all conditions, H was more soluble in Nb than it is in Ta or V. The solubility in Ta is higher than in V except for higher compositions, where the reverse is true. The maximum H solubility limits are independent of temperature and correspond to the atomic ratio 0.89 for Nb and V and 0.71 for Ta. Partial phase diagrams constructed for the three systems include the proposed boundaries of the heterogeneous two-phase region. The thermodynamic properties determined from the experimental data were in good agreement with those calculated from the statistical model.

AD-282 484 Div. 4, 25
(TISTM/GEC) OTS price $5.60

Army Ordnance Missile Command, Redstone Arsenal, Huntsville, Ala.
A STUDY ON OXYGEN-WATER VAPOR MIXTURES UNDER RF EXCITATION BY ELECTRON-PARAMAGNETIC RESONANCE TECHNIQUES,
by D. W. Howgate. 14 May 62, 59p. incl. illus. tables, 14 refs. (Rept. no. RR-TR-62-3)
Unclassified report

DESCRIPTORS: *Oxygen, *Water vapor, Excitation, Electrons, Radiofrequency, Electric discharge, Spectrographic analysis, Test methods, Hydroxides, Microwave spectroscopy, Mathematical analysis, Measurement, Theory, Chemical reactions, Paramagnetic resonance.

Applicability of the paramagnetic resonance technique to analyze combustion products of fuel mixtures ignited by RF discharges were studied. To test the underlying assumptions, water vapor and oxygen mixtures were analyzed at first. Qualitative as well as quantitative determination of atomic H atomic O, molecular O2, and OH radical was obtained from the EPR spectrum. Specifically, upon application of RF discharge on mixtures of water vapor (partial pressure, 50 to 200 microns) and O (partial pressure, 0 to 300 microns) the following information was obtained: the absence of the OH species below 100 microns water vapor pressure, and of the O species above 130 microns water vapor pressure; the lack of dependence of these cutoff pressures on the amount of O added to the water vapor previous to the discharge; the enhancement of the OH radical up to 5 times upon addition of sufficient O to the mixture; and the existence of the OH radical in a total concentration of less than 1% when observed. These results indicate that the extension of the paramagnetic resonance technique to measure the combustion products of fuel mixtures ignited by RF is feasible. Detection of atomic N, CH3, and other radicals by this technique is also possible. (Author)

AD-282 521 Div. 4, 25
(TISTM/ODN) OTS price $2.60

Dartmouth Coll., Hanover, N. H.
THERMOELECTRIC POWER OF NaCl CONTAINING CdCl2.
Rept. on Electrical Behavior of Ionic Crystals,
by R. C. Mueller, R. W. Christy, and Y. W. Hsueh.

# Division 4 - CHEMISTRY

AD-282 000 Div. 4, 16
(TISTM/REB) OTS price $1.60

Vanderbilt U., Nashville, Tenn.
GLYCIDIC ESTERS AND/OR ORGANIC DISULFIDES, AND RELATED SUBSTANCES, AS SOURCES OF ANTI-RADIATION DRUGS.
Annual progress rept. no. 1, 1 July 61-30 June 62 and Interim Research rept. no. 11, 1 Apr-30 June 62,
by Lamar Field, R. R. Crenshaw and others.
3 July 62, 20p.
(Contract DA 49-193-md-2030)
Unclassified report

DESCRIPTORS: *Radioprotective drugs, *Propionic acids, *Epoxides, *Esters, *Sulfides, *Thio radicals, *Sulfonates, *Penicillin, Materials, Synthesis, Oxidation, Chemical reactions, Reaction kinetics.

Seven compounds were submitted for screening as anti-radiation drugs: These are: (1) crude (phthalimido CH2)2CHSC(S)(NH2)2(+)Br(-); (2) (CH3)3-C-SO2-S-(CH2)2NH3(+)Cl(-); (3) p-CH3C6H4-SO2-S-(CH2)2NHCOCH3; (4) o-O2CC6H4SS(CH2)2NH3(+); (5) o-HO2CC6H4SS(CH2)2NHCOCH3; (6) p-CH3C6H4N=C(SC6H4-p-CH3)NHC6H4-p-CH3; and (7) (CH3)2N(CH2)2-SO2-S-(CH2)2N(CH3)2-2HCl. Oxidation of symmetrical and unsymmetrical disulfides to thiolsulfonates was studied. Considerable work is described relative to synthesis of o-2-aminoethyldithiobenzoic acid lactam. Studies on the rates of reaction of thiolsulfonates with thiols to give disulfides were initiated; interesting results in attempted oxidation of a hindered disulfide to a desired thiolsulfonate indicates marked resistance to oxidation. Other means for synthesizing thiosulfonates and disulfides have been developed or extended, for example by irradiation of a sulfonyl iodide in the presence of a disulfide and by attack of a sulfinate anion upon a thiosulfonate. A free aminothiosulfonate has been shown to be unstable in water, but this instability is not characteristic of all thiolsulfonates. (Author)

AD-282 034 Div. 4, 14
(TISTM/REB) OTS price $.50

Naval Research Lab., Washington, D. C.
NEW PARTIALLY FLUORINATED COMPOUNDS.
Interim rept.,
by J. G. O'Rear and P. J. Sniegoski. 18 July 62, 11p. incl. tables, 21 refs. (NRL rept. no. 5795)
Unclassified report

DESCRIPTORS: *Fluorides, *Esters, *Carboxylic acids, *Metallic soaps, *Carbamates, *Thio radicals, *Ethers, Lubricants, Dielectrics, Antioxidants, Copper, Wetting agents, Fluorination, Surface properties, Synthesis.

Twenty-seven new partially fluorinated compounds were synthesized specifically for study as surfactants, high dielectric fluids, and high-temperature antioxidants. Preparative procedures for the various compounds are described. The compounds include twenty fluoroesters, two copper soaps, two dicarbamates, two partially fluorinated hydrocarbons, and one thioether. All compounds are derived from fluoroalchols of the general formulas F(CF2)N times CH2OH and H(CF2)N times CH2OH or from the fluoroacid H(CF2)10COOH. Pertinent physical and chemical constants reported for the compounds include boiling point, melting point, density, refractive index, molecular refraction, and saponification equivalent. (Author)

AD-282 231 Div. 4, 16
(TISTM/TCG) OTS price $1.10

Wisconsin U., Madison.
DETERMINATION OF CHEMICAL STRUCTURES OF ANTIBIOTIC SUBSTANCES.
Final technical rept., 1 June 58-31 May 62,
by E. E. van Tamelen. 25 July 62, 9p. incl. table.
(Contract Nonr-120210, Proj. NR 108-389)
Unclassified report

DESCRIPTORS: *Antibiotics, *Streptomyces, *Molecular structure, Chemical reactions, Oxidation, Hydrolysis, Guanidines, Chemical analysis, Ultraviolet spectroscopy, Cellulose, Charcoal, Chromatographic analysis.

The structure of the complex antibiotic streptolin was established. Chemical and physico-chemical studies on oligomycin revealed many of the important structural features of this antibiotic. (Author)

AD-282 251 Div. 4
(TISTM/ODN) OTS price $3.60

Wisconsin U., Madison.
THE EFFECT OF MOLECULAR STRUCTURE ON CATALYSIS AND MOLECULAR BINDING.
Summary rept. (Final), 1 Nov 58-1 Dec 61,
by T. Higuchi. 10 Apr 62, 30p. incl. illus. tables, 9 refs.
(Contract DA 18-108-405-cml-265)
Unclassified report

DESCRIPTORS: *Molecular structure, *Reaction kinetics, *Catalysis, Hydrolysis, Chloromycetin, Amides, Complex compounds, Cyclohexanols, Dibasic acids, Isomer, Esters, Chemical equilibrium, Oximes, Salts, Methyl radicals, Propyl radicals, Carboxylic acids, Phenyl radicals, Phosphonic acids, Decomposition, Phosphorus compounds, Chemical bonds.

Basic information relating functions which influence the activities of molecular and ionic catalysts was sought. Two systems were investigated: (1) the hydrolytic behavior of sarin, and (2) the apparent bifunctional cleavage of the amide linkage in chloramphenicol. The hydrolytic behavior of the methylfluorophosphonate ester was subjected to detailed study. The investigation suggested that where molecular catalysis existed there was substantial evidence of formation of an intermediate complex between the fluoroester and the catalytic species. These studies have also shown the correct chemical pathway followed during interaction of catechol and catechol derivatives. The investigation of amide cleavage using chloramphenicol as the substrate indicates that dibasic acids facilitate the hydrolysis by means of bifunctional attack. In a series of dibasic aliphatic acids the effectiveness of the catalysts could be related to the sum of PK sub b + pK sub A2 for the half salt. Studies with cis and trans cyclohexane dicarboxylic acid were indicative of mediation of the amide cleavage by formation of molecular associations of the cis isomer with chloramphenicol. (Author)

AD-282 296 Div. 4, 14
(TISTM/TCG) OTS price $4.60

Electro-Optical Systems, Inc., Pasadena, Calif.
RESEARCH AND INVESTIGATION OF MATERIALS FOR LASER APPLICATIONS.
Interim engineering rept., 1 May-31 July 62,
by K. A. Yamakawa. 13 Aug 62, 37p. incl. illus. tables, 1 ref. (EOS rept. no. 3110-Q-1)
(Contract AF 33(657)8918)
Unclassified report

DESCRIPTORS: *Rare earth elements, *Chelate compounds, *Metalorganic compounds, *Lasers, Acetyl radicals, Acetones, Phthalocyanines, Phthalates, Chromium compounds, Aluminum compounds, Epoxy resins, Plastics, Glass,

DESCRIPTORS: *Amines, *Sulfides, *Sulfur compounds, *Polarographic analysis, Thio radicals, Ethyl radicals, Acetyl radicals, Mercury compounds, Phosphates, Solutions, Hydrogen ion concentration, Buffers, Complex compounds, Chemical analysis.

A polarographic method was developed for the determination of mercaptans in the presence of disulfides and vice versa. This method does not distinguish between separate mercaptans but yields only the total mercaptan and disulfide concentration in solution. The kinetics of the N-S acyl shift was studied for N-acetyl and S-acetyl-2-mercaptoethylamine and found to be incapable of polarographic investigation. The residual current in orthophosphate medium was determined to arise from the formation, in acid medium, of monobasic mercurous phosphate. Anodic polarographic data for 15 amine mercaptans are reported and certain general conclusions about their behavior are drawn. The complexing ability of 5 of these amine mercaptans was studied with Cu and Zn ions. (Author)

AD-282 870 Div. 4
(TISTM/GEC) OTS price $1.60

Naval Research Lab., Washington, D. C.
SHIPBOARD DETERMINATION OF DISSOLVED GASES IN SEA WATER BY GAS CHROMATOGRAPHY.
Final phase rept.,
by J. W. Swinnerton and J. P. Sullivan.
26 July 62, 13p. incl. illus. tables, 6 refs.
(NRL rept. no. 5806)
Unclassified report

DESCRIPTORS: *Sea water, *Chromatographic analysis, Chemical analysis, Gases, Oxygen, Nitrogen, Argon, Measurement.

Gas chromatography was used for the routine determination of dissolved O and N in sea water. Previously, dissolved O was determined aboard ship by the standard Winkler chemical method, but dissolved N analyses were seldom made, since the manometric techniques employed were extremely difficult to carry out because of the motion of the ship. To obtain dissolved N data thus required that hundreds of samples of sea water be stored in tightly stoppered containers until the analyses could be carried out at a shore-based laboratory. The feasibility of the gas chromatographic method has been established for routine shipboard determination of dissolved gases in sea water. The method is less time consuming, sample size is reduced, no loss is experienced in either precision or sensitivity, and the instrumentation is relatively simple. In addition, the method is largely automatic and the recorded results can be analyzed at some later and more convenient time. (Author)

AD-282 902 Div. 4, 7
(TISTM/GEC) OTS price $2.60

Aerospace Corp., Los Angeles, Calif.
CHRONOPOTENTIOMETRIC MEASUREMENTS OF ELECTRODE KINETICS FOR CHLORIDES OF TUNGSTEN, ANTIMONY, PHOSPHORUS, AND GROUP FOUR A,
by S. W. Mayer and W. E. Brown, Jr. 18 June 62, 19p. incl. illus. table, 20 refs. (Rept. no. TDR-69(2220-30)TN-1)
(Contract AF 04(695)69)
(DCAS TDR 62-119) Unclassified report

DESCRIPTORS: *Electrodes, *Platinum, *Fuel cells, Measurement, Chronographs, Potentiometers, Electrolytes, Methyl radicals, Formamides, Chlorides, Antimony compounds, Phosphorus compounds, Silicon compounds, Germanium compounds, Tin compounds, Oxychlorides, Diffusion, Chemical bonds, Catalysts, Reaction kinetics, Tungsten compounds, Electric potential, Electrochemistry.

Chronopotentiometry was utilized to measure rate constants for electro-reduction at Pt in dimethylformamide solution of several polyvalent halides of interest for regenerable fuel cell systems. Logarithms of the rate constants (in cm/sec) for the first reduction steps were: $SbCl_5$, -5.49; $SbCl_3$, -5.30; $PCl_5$, -9.53; $PCl_3$, -15.68; $POCl_3$, -10.02; $SiCl_4$ -5.50; $GeCl_4$, -8.11; $SnCl_4$, -42.8. Chronopotentiometric curves were also used to determine diffusion coefficients and products of the transmission coefficients with electrons involved in rate-determining steps. $WCl_6$ exhibited reversible behavior, with an $E_{1/4}$ of -0.159 volts for its one-electron first reduction step. The reduction of $SbCl_5$ to $SbCl_3$ occurred in two steps, suggesting the intermediate formation of $SbCl_4$. The Pt-catalyst surface area requirements for maximizing the efficiency of fuel cells involving $PCl_5$ and $SbCl_5$ were calculated. It was calculated that the $WCl_6$ fuel cell could produce 40% higher voltage than the $PCl_5$ fuel cell. (Author)

AD-282 922 Div. 4
(TISTM/GEC) OTS price $1.60

Pennsylvania U., Philadelphia.
REVERSIBLE OXYGEN ELECTRODES.
Quarterly rept. no. 2, 1 Feb-30 Apr 62,
by M. A. V. Devanathan. 30 Apr 62, 17p. incl. illus.
(Contract DA 36-039-sc-88921)
Unclassified report

DESCRIPTORS: *Oxygen electrodes, *Electrolytic cells, Platinum, Electrochemistry, Electric potential, Oxygen, Pressure, Absorption, Oxidation-reduction reactions, Gas diffusion, Reaction kinetics.

Conditions under which reversible O electrodes may be set up on Pt have been examined. Exposure to gaseous O seems to be essential for the rapid setting up of the reversible potential in purified solutions. Preliminary investigation of the extent of O adsorption by Pt show that the coverage is approximately 50% at a partial pressure of 1 atmosphere and 15% at 1/5 atmosphere partial pressure. (Author)

AD-282 966 Div. 4
(TISTW/RD) OTS price $1.60

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
RELATION OF EQUILIBRIUM PHASE TRANSITION PRESSURE TO IONIC RADII,
by Vladimir Stubican and Rustum Roy. 30 June 62, 9p. illus. 6 refs. (Technical rept. no. 15; Contribution no. 62-2)
(Contract Nonr-65620, Proj. NR 032-441)
Unclassified report

DESCRIPTORS: *Rare earth compounds, Lutecium, Vanadates, Oxides, Arsenic compounds, Holmium, Dysprosium, Phase transitions.

P-t equilibria for a series of some 20 rare earth arsenates ($LnAsO_4$) and vanadates ($LnVO_4$) which undergo reconstructive transitions (xenotime = scheelite) in the region 10,000-60,000 atm. were obtained. From these curves, a set of data was extracted representing (under a fair approximation to corresponding states) the change of equilibrium pressure for a transition as a function of the radius of the $Ln^{3+}$ im. The unexpected result is a V shaped curve in both the arsenates and the vanadates showing a minimum transformation pressure near $Dy^{3+}$ or $Ho^{3+}$. An interesting even-odd effect is also noted. (Author)

Aug 62, 13p. illus. 25 refs. (Technical rept. no. 2)
(Contract Nonr-279900, Proj. NR 032-460)
Unclassified report

DESCRIPTORS: *Thermoelectricity, *Sodium compounds, *Cadmium compounds, *Chlorides, Platinum, Crystals, Halides, Laboratory equipment, Conductors, Silver compounds, Alkali metal compounds, Electrodes, Chemical impurities, Temperature.

The thermoelectric power of NaCl was measured as a function of temperature between 550 C and the melting point, using Pt metal electrodes. Measurements were made on pure material, and on material doped with 0.1% CdCl2. Compared with the theory of Howard and Lidiard, the results yield a value of the order of -1 eV for the sum of the cation and anion vacancy heats of transport, although the accuracy is low because of reactions occurring at the electrodes and uncertainties in the ratio of defect mobilities. (Author)

AD-282 699 Div. 4, 16
(TISTM/EJH) OTS price $3.60

Naval Propellant Plant, Indian Head, Md.
PROPERTIES OF ORGANIC SOLVENTS,
by John E. Morgan. 27 Feb 62, 1v. incl. tables, 4 refs.
Unclassified report

DESCRIPTORS: *Organic solvents, *Handbooks, Toxicity, Hazards, Physical properties, Tables.

This memo was developed to assist technical personnel in performing their jobs capably and safely and to provide them with a ready, accessible source of information on the more commonly used solvents. It is planned to periodically update this information. The footnotes pertaining to the effects of solvents on humans are interpretations of published information. (Author)

AD-282 763 Div. 4
(TISTM/MS) OTS price $2.60

Malaker Labs., Inc., Mountainside, N. J.
DETERMINING A METHOD TO INHIBIT THE INTERACTION OF ALKALI PERCHLORATE AND WATER.
Progress rept. no. 5, 1 Oct 61-28 Feb 62,
by C. J. Anderson and R. Del Grosso. 28 Feb 62, 16p. incl. illus. table (Rept. no. CM 106-8)
(Contract DA 30-069-ORD-3202, Proj. NR TS 5-5407)
Unclassified report

DESCRIPTORS: *Pyrotechnics, *Powders, *Physical chemistry, *Water, Inorganic substances, Organic coatings, Perchlorates, Calcium compounds, Nitrates, Fluorides, Ammonium radicals, Carbonates, Magnesium, Aluminum, Test methods, Metal coatings, Coatings, Inhibition.

The study was continued during this report period, with the emphasis on calcium nitrate. The basic approach was to protect the powder with a coating. Attempts were made to coat the powder with magnesium, aluminum, carbonate, fluoride, and several organic materials. (Author)

AD-282 779 Div. 4, 25
(TISTM/GEC) OTS price $2.60

California U., Berkeley.
INFRARED SPECTROSCOPIC STUDY OF THE PHOTOLYSIS OF HN3 IN SOLID CO2,
by Dolphus E. Milligan, Marilyn E. Jacox and others. June 62, 24p. incl. tables, 23 refs.
(Contract AF 49(638)944; In cooperation with Mellon Inst., Pittsburgh, Pa.
(AFOSR-2987) Unclassified report

DESCRIPTORS: *Hydrogen compounds, *Deuterium, *Photolysis, Solids, Carbon dioxide, Infrared spectroscopy, Low temperature research, Ultraviolet spectroscopy, Optical spectrometers, Gas diffusion, Nitrogen compounds, Oxides, Azides.

Infrared studies were carried out on the photolysis of HN3 and DN3 in CO2 matrices at 20 and 53 K. HNO and DNO were identified as products of the reaction of NH and ND with CO2. The presence of HNO was confirmed by the detection of absorptions at 7600, 7100, and 6850 A in the visible spectral region. Evidence has also been obtained for the production of a 1:1 compound between NH (ND) and CO2. Several possible structures for this species are discussed. (Author)

AD-282 814 Div. 4, 25
(TISTM/EJH) OTS price $10.50

Ultrasonics Research Lab., Western Reserve U., Cleveland, Ohio.
ULTRASONIC RELAXATION IN ELECTROLYTIC SOLUTIONS: I. A REVIEW,
by John Stuehr and Ernest Yeager. 1 July 62, 127p. incl. illus. tables (Technical rept. no. 25)
(Contract Nonr-143904, Proj. NR 384-305)
Unclassified report

DESCRIPTORS: *Electrolytes, *Ultrasonics, *Relaxation time, Sound, Absorption, Solutions, Dissociation, Ions, Reaction kinetics, Protons, Hydrolysis, Test methods, Bibliography.

The available relaxation data for electrolytes is reviewed and critically evaluated. Ultrasonic relaxation theory is reviewed with particular reference to solutions of electrolytes. Specific processes include the relaxation of the ionic atmosphere surrounding ions in solution, and unimolecular and dissociation reactions. The theoretical treatment of the multiple relaxation effects associated with consecutive equilibria is reviewed. Eigen (1958-61) has shown that the observed acoustic absorption data in divalent sulfates can be explained on the basis of the step-wise loss of hydration water from between the partners of cation-anion ion pairs. This mechanism is used to examine critically the ultrasonic absorption data in solutions of divalent sulfates, thiosulfates, and chromates. A number of proton-transfer reactions (e.g. hydrolysis or acid-base dissociation) have been studied by several relaxational techniques. Rate constants for reactions between ions in aqueous solution approach the theoretical limiting values anticipated for primarily diffusion-controlled processes. Representative values are collected and discussed in relation to the mechanisms responsible for the relaxation effects. A brief survey of experimental methods for measuring ultrasonic absorption is given in an appendix. (Author)

AD-282 857 Div. 4
(TISTM/EJH) OTS price $1.60

Maryland U., College Park.
THE DETERMINATION OF ORGANIC MERCAPTAN AND DISULFIDE GROUPS.
Final technical rept., 1 Sep 59-31 Aug 62,
by William C. Purdy. 31 Aug 62, 18p. incl. illus. tables, 9 refs.
(Contract DA 49-193-md-2052)
Unclassified report

significantly decreased by the presence of MgBr2 in the reaction mixture. Kinetic data for these reactions were obtained. (Author)

# 5. COMMUNICATIONS

AD-282 144 Div. 5, 8
(TISTP/JW) OTS price $4.60

Jansky and Bailey Div., Atlantic Research Corp., Washington, D. C.
A STUDY OF HIGH FREQUENCY COMMUNICATIONS IMPROVEMENT TO OVERCOME THE IMPACT OF MINIMUM SOLAR ACTIVITY.
Final rept. on Volume I-2,
by Leon H. King. July 62, 46p. incl. illus. tables, 29 refs.
(Contract SD-98)
Unclassified report

DESCRIPTORS: *Radio communication systems, *Radio receivers, *Antennas, *Ionospheric propagation, High frequency, Sunspots, Impact shock, Data processing systems.

A study program has been completed concerning the probable effects of the solar cycle minimum on the Defense Communications System (DCS). The program was divided into three phases. Phase One consisted of the accumulation, reduction, and analysis of data to determine the anticipated impact of the solar cycle minimum on selected trunks of the DCS. Phase Two consisted of the accumulation and evaluation of data on fully developed currently available means of reducing the anticipated impact, and the effectiveness and relative costs of implementation. Phase Three consisted of a review of state-of-the-art developments which may lead to improved high-frequency communications systems within the next five years. This final report summarizes the results obtained in the three phases of the program. (Author)

AD-282 165 Div. 5
(TISTE/CAM) OTS price $4.60

Radiation, Inc., Orlando, Fla.
REPEATER, TELEGRAPH TH-38 ( )/G.
Quarterly progress rept. no. 2, 1 Mar-31 May 62,
by R. A. Cauble, R. D. Squires, and H. E. Fidler. 1 May 62, 30p. incl. illus. tables (Rept. no. 2)
(Contract DA 36-039-sc-87245)
Unclassified report

DESCRIPTORS: *Telegraph repeaters, *Telegraph equipment, Communication equipment, Electronic circuits, Circuits, Switching circuits, Transistors, Inverted rectifiers, Paper capacitors, Radiofrequency filters, Magnetic amplifiers, Power supplies, Polarization, Design, Tests, Reliability, Life expectancy.

This research concerns the design, development and fabrication of 20 Telegraph Repeaters TH-38 ( )/G. The repeater is designed to operate in three different modes; half duplex, full duplex and half duplex-full duplex. Using the converter, circuits of differing characteristics may be interconnected and normal traffic established. A prime requisite is to achieve a Mean Time Between Failure (MTBF) of 57,000 hours. Temperature and life test conducted on the output keyer proved the acceptability of this switching scheme. The transistor keyer was adopted as the method of keying the output line. The redesign of the power supplies resulted in a significant improvement in the MTBF rate. The regulation was improved and the output ripple reduced in addition to achieving a more reliable design. Each portion of the TH-38 was thoroughly tested over the temperature range and all operating modes checked. The unit meets or exceeds all of the requirements that were checked to date. (Author)

AD-282 198 Div. 5, 8, 12
(TISTP/JW) OTS price $3.60

Kiruna Geophysical Observatory (Sweden).
INVESTIGATIONS OF PROPERTIES OF THE AURORAL ZONE IONOSPHERE BY MEANS OF A RADIOASTRONOMICAL SWEPT-FREQUENCY INTERFEROMETER, COVERING THE FREQUENCY BAND 35-65 Mc/s,
by Ludwik Liszka. 1 Feb 62, 16p. illus. tables, 15 refs. (Scientific rept. no. 4)
(Contract AF 61(514)1314)
(AFCRL 62-380) Unclassified report

DESCRIPTORS: *Interferometers, *Radiation effects, *Ionosphere, Intensity, Radio signals, Satellite vehicles, Density, Broadband, Magnetic effects, Measurement, Space environmental conditions.

Results obtained with the help of a radioastronomical swept-frequency interferometer at Kiruna Geophysical Observatory during the months March - December, 1961, are discussed. A special type of increase of the broad-band radiation intensity of the radio-source Cassiopeia has been observed. This seems to result from the focusing effect of single ionospheric regions of a size larger than the first Fresnel zone. An investigation of correlation of the increases with other geophysical parameters has also been made. (Author)

AD-282 199 Div. 5, 8, 12
(TISTP/JW) OTS price $2.60

Kiruna Geophysical Observatory (Sweden).
STUDIES OF HF- AND VHF-AURORAL ZONE PROPAGATION.
Final rept.,
by Ludwik Liszka. 1 Mar 62, 23p. incl. table, 21 refs.
(Contract AF 61(514)1314)
(AFCRL 62-381-A) Unclassified report

DESCRIPTORS: *Satellite vehicles, *Radio transmission, *Aurorae, High frequency, Very high frequency, Radio astronomy, Scintillation counters, Interferometers, Diurnal variations, Doppler tracking, Ionospheric disturbances, Radio signals.

Results obtained with the help of a radioastronomical swept-frequency interferometer are discussed. A special slow scintillation of the radio-source Cassiopeia has been observed. This seems to result from the focusing effect of single, large-size ionospheric regions. An investigation of the correlation of their occurrence and properties with other geophysical parameters has also been made. A discussion of the methods of Doppler- and signal strength measurements of satellite transmissions is included. Results of observations of Sputnik III, for which the largest amount of observational material has been obtained, are discussed. The 'dropout' phenomenon, and its connection with other geophysical phenomena, has been studied in detail. Faraday-fading and amplitude-scintillations have been studied in connection with magnetic activity, spread-F and sporadic-E. Diurnal and seasonal variations of the occurrence-frequency of the Faraday-fading and amplitude-scintillations have also been investigated. Measurements of the frequency of Faraday-fading have been used for calculations of local electron densities and total electron amount. Some 'on-board' measurements, for example corpuscular radiation intensity measurements of Explorer VII, have also been recorded. (Author)

# Division 4 - CHEMISTRY

AD-283 042 Div. 4
(TISTM/GEC) OTS price $2.60

Aerojet-General Corp., Azusa, Calif.
KINETICS OF THREE-BODY ATOM RECOMBINATION,
by C. B. Kretschmer and H. L. Petersen.
June 62, 22p. incl. illus. tables, 20 refs.
(Rept. no. AN-625)
(Contract AF 49(638)540, Proj. 9750)
Unclassified report

DESCRIPTORS: *Recombination reactions, *Reaction kinetics, Statistical analysis, Theory, Measurement, Nitrogen, Oxygen, Hydrogen, Dissociation, Chemical reactions, Temperature, Atoms.

The following values of the three-body recombination rate constant in units of cc sq per mole sq sec were measured at 300 or 350 K: N + N + N2 yields N2 + N2, 8.0 x 10 to the 14th power; N + O + N2 yields NO + N2, 3.3 x 10 to the 15th power; and H + H + H2 yields H2 + H2, 8.9 x 10 to the 15th power. The rate constant for the reaction N + O yields NO + O was found to be 5 x 10 to the 7th power cc/mole sec at 350 K. A statistical-mechanical calculation of the three-body recombination rate constant gave values which agreed well with the above experimental results and also reproduced the previously determined value of less than 2.5 x 10 to the 14th power cc sq per mole sq sec for O + O + O2 yields O2 + O2. The large variation in rate constant for different gases is due mainly to differences in atomic masses and statistical weights. Redissociation of molecules in high vibrational levels is important in reducing the net rate of recombination. At high temperatures, the theory predicts a rate constant varying as T to the minus 0.4 power. (Author)

AD-283 043 Div. 4
(TISTM/GEC) OTS price $2.60

Aerojet-General Corp., Azusa, Calif.
KINETICS OF RECOMBINATION PROCESSES.
Final technical rept., 15 Apr 59-14 June 62,
by C. B. Kretschmer. 14 June 62, 24p. incl. tables, 6 refs. (Rept. no. AN-671)
(Contract AF 49(638)540, Proj. 9750)
Unclassified report

DESCRIPTORS: *Recombination reactions, *Reaction kinetics, Theory, Nitrogen, Hydrogen, Nitrogen compounds, Oxygen compounds, Hydrogen compounds, Helium, Ions, Argon, Hydroxides, Cesium, Gas discharges, Plasma physics, Measurement, Nitro radicals, Carbon compounds, Water vapor, Electrons, Gas diffusion, Free radicals, Peroxides.

Rate coefficients for formation of N2, NO, H2, HO2, H2O2, He2(+), and Ar2(+) from atoms, atomic ions, or free radicals in triple collisions were measured at 300 K. A theoretical evaluation of the rate coefficient for diatomic molecule formation in triple collisions was carried out, giving results which agreed well with the experimental values. Rate coefficients for several bimolecular reactions involving O atoms, N atoms, or OH radicals were also determined. A theory of positive ion collection by Langmuir probes in gas discharge plasmas at pressures between about 0.1 and 20 mm Hg was developed. Dissociative recombination coefficients of Ar, N, O, Hg, and Cs molecular ions were determined from probe measurements on gas discharge afterglows, using this theory to calculate ion concentrations from probe currents. Recombination coefficients obtained in this manner agreed well with values obtained by microwave techniques. (Author)

AD-283 044 Div. 4, 25
(TISTM/GEC) OTS price $2.60

Aerojet-General Corp., Azusa, Calif.
KINETICS OF RECOMBINATION OF ATOMIC OXYGEN AT ROOM TEMPERATURE,
by H. L. Petersen and C. B. Kretschmer. Nov 60, 17p. illus. tables, 18 refs. (Rept. no. TN-38)
(Contract AF 49(638)540, Proj. 9750)
(AFOSR TN 60-1478) Unclassified report

DESCRIPTORS: *Recombination reactions, *Reaction kinetics, *Oxygen, Heat transfer, Hypersonics, Hydroxides, Nitrogen compounds, Oxides, Catalysis, Peroxides, Hydrogen compounds, Thermal radiation, Theory, Measurement, Water, Ozone.

Oxygen was partly dissociated by a microwave discharge in static experiments, and the absolute concentration of atoms was determined with a Wrede gage. The rate of recombination was measured by observing the radiation emitted as a result of the reaction of O atoms with a trace of NO2. An upper limit of 2.5 x 10 to the 14th power cc sq./mole sq. sec was established for the rate constant at 350 K of the reaction O + O + O2 yields O2 + O2. Since this upper limit is 1/3 to 1/2 times the value found in shock-tube experiments for the same rate constant at 3500 K, it is concluded that the rate constant increases slowly with temperature instead of varying as an inverse power of absolute temperature, as has conventionally been assumed. In the same experiments, the rate constant for the reaction O + O2 + O2 yields O3 + O2 was found to be 1.1 x 10 to the 14th power cc sq./mole sq. sec at 350 K, in excellent agreement with other recent determinations. Recombination was strongly catalyzed by OH radicals in accordance with the mechanism O + OH + O2 yields HO2 + O2 and O + HO2 yields OH + O2. The rates of these reactions are reported. (Author)

AD-283 098 Div. 4
(TISTM/EJH) OTS price $8.10

Massachusetts Inst. of Tech., Cambridge, Mass.
REACTIONS OF ORGANOMAGNESIUM COMPOUNDS WITH ALPHA, BETA-UNSATURATED KETONES, PART I. REACTIONS OF ORGANOMAGNESIUM COMPOUNDS WITH SATURATED KETONES, PART II.
Doctoral thesis,
by Daniel D. Tranficante. 9 July 62, 72p. incl. illus. tables, 92 refs.
Unclassified report

DESCRIPTORS: *Metalorganic compounds, *Ketones, *Magnesium compounds, Methyl radicals, Ethyl radicals, Phenyl radicals, Bromides, Grignard reagents, Alkoxy radicals, Butenes, Chemical reactions, Reaction kinetics, Catalysis, Grignard reactions.

The reactions of trans-4-phenyl-3-buten-2-one (8b) and trans-3-penten-2-one (8a) with dimethyl-, diethyl- and diphenylmagnesium were studied. The ratio of conjugate to normal addition observed was decreased only slightly by the presence of $MgBr_2$ in the reaction mixture. In the reaction of the ketone 8b with diethylmagnesium, variations in the concentration of either reactant did not significantly alter the proportions of normal and conjugate addition products. The presence of cuprous ion favored conjugate addition both with the diaryl- and dialkyl-magnesiums and with the Grignard reagents. The presence of excess isoprene in the reaction mixtures did not reduce the proportion of conjugate addition. The reactions of 3-pentanone (2) and 2,4-dimethyl-3-pentanone (6) with diethyl- and alkoxyethyl-magnesium (1) were studied. The ratio of enolization and reduction of normal addition was

AD-282 471 Div. 5
(TISTB/AW) OTS price $4.60

North American Aviation, Inc., Downey, Calif.
SECURE COMMUNICATIONS, A BIBLIOGRAPHY.
Rept. for 1956-1962.
19 Apr 62, 35p. (Rept. no. SID 62-518)
Unclassified report

DESCRIPTORS: *Bibliography, *Secret communication systems, *Communication systems, Communication theory, Communication equipment, Coding, Errors, Radio communication systems, Military communications, Voice communication systems, Cryptography, Countermeasures, Radio jamming, Telephone communication systems, Pulse communication systems, Detection, Aeronautics.

A survey of the literature covering the period 1956 to 1962 is given. There are 176 references arranged alphabetically by corporate author, including two basic text books. A personal author index and a subject index follow the references. (Author)

AD-282 473 Div. 5, 12
(TISTA/GEC) OTS price $8.60

North American Aviation, Inc., Downey, Calif.
SPACE TELEVISION. A DOCUMENTARY SURVEY.
23 May 62, 86p. (Rept. no. SID 62-613)
Unclassified report

DESCRIPTORS: *Television, *Bibliography, *Television display systems, *Television antennas, Design, Theory, Instrumentation, Space capsules, Spaceships, Space probes, Satellite vehicles, Lunar probes, Astronomy, Space flight.

This report is a survey of the literature since 1957 on the uses of television as a component of space research systems. Included are developments in television display tubes; antenna theory and design; instrumentation; and in astronomy. (Author)

AD-282 698 Div. 5
(TISTE/CAM) OTS price $8.60

National Cash Register Co., Dayton, Ohio.
HIGH FREQUENCY DIGITAL COMMUNICATION SYSTEM.
Quarterly progress engineering rept. no. 4,
1 Mar-31 May 62. 15 July 62, 1v. incl. illus. tables, refs. (Rept. no. 3-4Q)
(Contract AF 33(600)42197)
Unclassified report

DESCRIPTORS: *Communications systems, *Digital systems, *Radio communication systems, *Data transmission systems, High frequency, Generators, Propagation, Doppler systems, Multipath transmission, Coding, Digital computers, Computer logic, Electronic circuits, Switching circuits, Timing circuits, Design, Reliability, Errors, Airborne, Tests.

Progress made in the development of special modulation, demodulation digital control and coding equipment is discussed. Technical information describes and explains the operation of each digital subunit used in the control and coding equipment. Timing and logic diagrams of each subunit are included. A reference index is provided. (Author)

AD-282 713 Div. 5, 12
(TISTE/CRJ) OTS price $21.00

General Electric Co., Syracuse, N. Y.
PASSIVE SPHERICAL SATELLITE COMMUNICATIONS STUDY.
Final rept., vol. 1.
July 62, 1v. incl. illus. tables, refs. (Rept. no. DSD-ASER 6-62)
(Contract AF 30(602)2222, Proj. 4519)
(RADC TDR 62-136, vol. 1)
Unclassified report

DESCRIPTORS: *Satellite vehicles, *Radio communication systems, *Radio relay systems, *Radio relay stations, Signal-to-noise ratio, Orbital flight paths, Surface to surface, Reflectors, Electromagnetic wave reflections, Antennas, Modulation, Modulators, Radio jamming, Radio antijamming, Tracking, Radiofrequency, Solar energy, Data transmission systems, Radio signals, Polarization, Reflection, Multiplex transmission, Radio transmission, Mathematical analysis, Digital computers, Communication systems.

Contents: Orbital coverage and satellite switching: Switching; Proof of existence of equal range sums; Relation between orbit configuration and system design. Lifetime of perturbed orbit system: Injection velocity errors, solar radiation pressure; Combined system lifetime. A system configuration: The global station network. Equipment pre-design considerations: Modulation studies; Tracking and acquisition; Combination of communicating and tracking functions; typical frequency assignment of European A and B stations; typical operational performance including first and second acquisition mode. System logic and control. Frequency assignment considerations: Selection of frequency range; Number of frequency allocation channels; Frequency assignment. Identifiable problem areas requiring further work.

AD-282 798 Div. 5
(TISTE/CRJ) OTS price $5.60

Radiation Inc., Melbourne, Fla.
TELEGRAPH REPEATER TH-38( )/G.
Reliability rept. on Phase I,
by R. Green. 12 June 62, 52p. incl. illus.
(Document no. B1556-RG-2)
(Contract DA 36-039-sc-87254)
Unclassified report

DESCRIPTORS: *Telegraph repeaters, *Reliability, Design, Maintenance, Synthesis, Series, Mathematical analysis.

Estimates are made regarding the reliability of the Telegraph Repeater TH-38( )/G. Estimates indicate that the design reliability goal of 57,000 hours mean-time-between-failure is a realizable goal. (Author)

AD-282 947 Div. 5, 8
(TISTE/CAM) OTS price $3.60

Motorola, Inc., Chicago, Ill.
DATA TRANSMISSION INVESTIGATION.
Quarterly progress rept. no. 3, 11 Mar-10 June 62,
by J. J. Tsimbidis. 10 June 62, 1v. incl. illus. tables.
(Contract DA 36-039-sc-87343, Proj. 3B31-01-001)
Unclassified report

DESCRIPTORS: *Data transmission systems, *Military communications, *Voice communication systems, *Digital systems, Errors, Noise, Simulation, Radio communication systems, Circuits, Test methods, Magnetic recording systems, Transmission lines.

Results obtained in back-to-back white noise testing of the various modems are discussed. Problems of crosstalk and transmission levels

# Division 5 - COMMUNICATIONS

AD-282 256 Div. 5
(TISTP/FR) OTS price $9.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
AUTOMATED SOLUTION OF COMBINED INTERFERENCE MATRICES.
Quarterly rept. no. 2, 15 Feb-15 May 62,
by I. E. Perlin, R. Techo, and A. P. Jensen.
15 May 62, 104p. incl. illus.
(Contract DA 36-039-sc-88920, Proj. 3A99-06-001-03) Unclassified report

DESCRIPTORS: *Radio communication systems, *Radio interference, Frequency, Mathematical analysis, Digital computers, Programming.

A procedure is presented for determining sets of frequencies which can be assigned to a communication network consisting of a communication center and several distinct distant sites. For this network, it is assumed that (1) the operation is full duplex, (2) the channel spacing may be non-uniform over the range of operation, and (3) the frequency bands within the range of operation do not overlap. Each set of frequencies determined by this procedure is free of interference due to spurious emissions and spurious responses. Further, each set of frequencies is required to be free of interference due to transmitter intermodulation. This procedure is explained in detail. The computer program for automating this frequency assignment process is given in complete detail through a fully annotated computer program listing in the language of the Burroughs Algebraic Compiler. A preliminary analysis of the problem of developing basic communication networks for equipments with overlapping frequency ranges is presented. (Author)

AD-282 311 Div. 5
(TISTW/PCR) OTS price $3.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE WEST FORD ANTENNA FEED SYSTEM,
by L. Niro. 5 Mar 62, 29p. incl. illus. refs.
(Technical rept. no. 259)
(Contract AF 19(604)7400)
(AFESD TDR 62-111) Unclassified report

DESCRIPTORS: *Parabolic antennas, *Radio communication systems, X band, Dipole antennas, Scattering, Beams, Antenna horns, Microwaves, Radomes, Phase measurement, Impedance, Electronic circuits, Microwave networks, Reflectors, Electromagnetic wave reflections.

The West Ford orbital scatter communication system, which operates in the X-band, consists of two installations - one located at Camp Parks, Pleasanton, Calif., and the other at Westford, Mass. Each installation employs a Cassegrainian antenna system that uses a paraboloidal reflector 60 ft in diameter. The West Ford antennas are intended to operate in conjunction with a belt of metallic dipoles orbiting the earth. These dipoles, tuned to approximately 8000 Mc, will function as a scattering medium between the two ground systems in the same way that the troposphere functions in a tropospheric-scatter communication system. In using this belt to establish and hold communications, each West Ford antenna emits a communication beam while receiving and tracking the other antenna's communication beam. Thus, it is feasible for both antenna systems to illuminate a common volume of the orbit belt. The requirements, design considerations, and final RF measurement results of the over-all West Ford antenna and individual components are discussed. (Author)

AD-282 334 Div. 5
(TISTW/DLW) OTS price $5.60

Stanford Electronics Labs., Stanford U., Calif.
THE PROBABILITY OF INTERCEPTING RADIO SIGNALS SCATTERED BY METEOR TRAILS,
by U. R. Embry. Mar 62, 50p. incl. illus. table, 17 refs. (Technical rept. no. 773-1; SEL-62-012)
(Contract AF 30(602)2398, Proj. 4505)
(RADC TDR 62-249) Unclassified report

DESCRIPTORS: *Radio interception, *Radio signals, *Radio communication systems, Meteors, Interception, Very high frequency, Detection, Mathematical computer data, Probability, Scattering, Vulnerability.

The possibility of detecting communication systems which use signals scattered by meteor trails, and intercepting information passed over such systems is discussed. To obtain the statistical data required on the fraction of meteor trails that scatter energy to an intercept location, and the fraction of transmitted messages that can be intercepted, a computation program is formulated. For a specified distribution of meteor sources, the fraction of the meteor trails that will scatter a signal to any point in a large area about the transmitter, and the fraction of message fragments received that can be intercepted at any point in the region about a receiver location, can be readily found. The computed results for a uniform distribution of meteor sources across the sky are displayed graphically. An example is worked out showing that the data can be used to estimate the performance of a meteor-scatter communications link. Sample computations on the probability of detecting the operation of a meteor-burst communications system are carried out. Finding the locations of transmitters using meteor-scatter signals, recognition of operating characteristics, and the interception of information passed over such links are also discussed. (Author)

AD-282 446 Div. 5
(TISTW/DLW) OTS price $8.60

Motorola, Inc., Chicago, Ill.
SYNCHRONIZED SELECTIVITY RECEIVER.
Final rept., 1 Apr 59-31 May 61,
by Francis H. Hilbert and William Rapshys.
31 May 61, 1v. incl. illus. 18 refs.
(Contract DA 36-039-sc-78289)
Unclassified report

DESCRIPTORS: *Radio receivers, *Voice communication system, *Speech transmission, Sensitivity, Broadband, Electronic circuits, Synchronizers, Discriminators, Phase detectors, Phase modulation, Signal-to-noise ratio, Detection, Narrowband, Frequency modulation, Radio ranges, Intelligibility.

Synchronized selectivity was investigated as a method of improving receiver range through threshold improved performance of voice communications (index of modulation 5) FM receivers. Results were negative. Techniques of frequency compression and phase tracking were also evaluated for improved range. Results were negative. A re-examination of threshold phenomena showed this to necessarily be the case for the index of modulation used. However, if wide band FM were abandoned and narrow band PM utilized, threshold does not occur and the superior weak signal performance and range of an AM system results. (Author)

A collection of 3,465 detailed reports of sightings of surface vessels from aircraft of the U. S. Coast Guard are analyzed by probit analysis to determine visual thresholds and measures of variance of the thresholds. Each of 17 conditions affecting the sighting range is studied separately to determine its effect. In each case, tables of probit results and graphs are included. A table of factors for each condition is included to allow forecasting of sighting thresholds and explanation of use for any probability level. A random selection of sightings is made in order to supply conditions for use of these factor tables as a demonstration of forecasting and as a test of the reliability of the data and of the forecasting method. (Author)

AD-281 910 Div. 6, 5, 12
(TISTW/DLW) OTS price $8.60

Space Technology Labs., Inc., Los Angeles, Calif.
PARAMETERS PERTINENT TO THE DETECTION OF ULTRAVIOLET RADIATION IN SPACE-TO-SPACE CONFIGURATIONS,
by Leonard Glatt. June 62, 86p. incl. illus. 3 refs. (Rept. no. 6110-7244-RU-000)
(Contract AF 04(694)1)
(BSD TDR 62-121) Unclassified report

DESCRIPTORS: *Ultraviolet research, *Space environmental conditions, *Ultraviolet detectors, *Ultraviolet communication systems, *Ultraviolet radiation, Signal-to-noise ratio, Interference, Detection, Scattering, Solar noise, Spaceships, Space flight, Wave transmission.

The ultraviolet spectral region below 2800 Angstroms might prove advantageous for passive space-to-space surveillance, and for the active transmission of secure messages between friendly spacecraft. This follows since terrain based countermeasures would be frustrated by the opacity of the atmosphere and because the background noise would be at a minimum. The success of either of these applications would be dependent upon the reception of signals suitably above the noise level set by the combination of background and system noises. The physical origins of possible target signals and of background noise are discussed and related to more basic parameters. Some estimates are given for the expected magnitudes of these quantities under the assumptions of various realistic configurations. Signal-to-noise relations are presented. (Author)

AD-281 915 Div. 6, 22
(TISTW/DLW) OTS price $8.10

Capehart Corp., Richmond Hill, N. Y.
RF TO OPTISONIC BOLOMETER.
Final engineering technical rept. of Feasibility Study and Development.
1 Aug 62, 82p. incl. illus. tables, 9 refs.
(Rept. no. 62-8-1)
(Contract N178-7914)
Unclassified report

DESCRIPTORS: *Bolometers, *Electric detonators, *Temperature warning systems, *Ultrasonics, *Infrared radiation, Hazards, Electromagnetic fields, Electric bridges, Electric wire, Detectors, Design, Thermistors, Temperature, Data transmission systems, Measurement.

The RF to optisonic bolometer system consists of separate transmitting and receiving units operating over an ultrasonic data link. The miniature transmitter is completely self-contained and may be inserted completely within the electroexplosive device, transmitting out through the device structure by means of an ultrasonic carrier. Transmitter modulator information is provided by a thermistor which detects and measures the infrared radiation given off by the detonating bridge wires. In operation, the transmitter is substituted for the igniter in an electroexplosive device and the remote receiver monitors the bridge wire temperature as the device is subjected to an electromagnetic radiation environment. An operational system was tested. Data, relating bridge wire characteristics to numerous parameters, were compiled. (Author)

AD-282 153 Div. 6
(TISTW/RD) OTS price $1.60

Naval Ordnance Lab., White Oak, Md.
PREDICTION METHODS FOR SONAR SYSTEMS,
by R. J. Urick. 1962, 15p. incl. 10 refs.
Unclassified report

DESCRIPTORS: *Underwater explosions, *Sonar, Mathematical prediction, Echo ranging, Sonar targets, Detection, Signal-to-noise ratio, Underwater sound transmission, Underwater sound generators, Sonar signals, Underwater sound signals, Ocean waves, Oceans, Scattering, Range.

Performance prediction in sonar is centered around the so-called sonar equation relating various parameters defined by the medium, the target, and the equipment. An active sonar equation valid for both short transient and long-pulse sonars is presented, and a discussion is given of each of the sonar parameters. Of particular interest is a generalized source level for comparing explosive and pulsed sonars, and prediction expressions for reverberation and detection threshold. An illustration of the use of these concepts is a recent determination of the back-scattering coefficient of the deep sea bed using explosive sound sources. (Author)

AD-282 347 Div. 6, 2
(TISTW/DLW) OTS price $7.60

Allied Research Associates, Inc., Boston, Mass.
WEATHER RADAR RESEARCH AND APPLIED TECHNIQUES.
Final rept., 1 Dec 58-30 Nov 61,
by Roland J. Boucher. 30 Nov 61, 70p. incl. illus. tables, refs.
(Contract AF 19(604)5204, Proj. 8620)
(AFCRL 62-487) Unclassified report

DESCRIPTORS: *Meteorological radar, *Weather forecasting, *Radar echo areas, Theory, Meteorology, Plan-position indicators, Hail, Lightning, Snow, Storms, Radar equipment, Effectiveness, Airport radar systems, Radar reflections, Precipitation.

Weather radar research on the development of short range forecast techniques are summarized. Objective techniques are outlined for utilizing PPI radarscope information in forecasting the onset of precipitation from echo lines, echo sheets with marked edges and amorphous echo fields. By means of an empirical study the degree of electrical activity in thunderstorms is shown to have a definite relationship to the intensity of the associated radar echo. A theoretical investigation of the observed high level reflectivity maximum in thunderstorms offers hail growth in restricted size intervals as a possible contributary effect. The importance of radar echo distribution with height to the correct interpretation of the change in the apparent size of echo patterns is theoretically demonstrated. Radar cross-sections and attenuations of rain based on more accurate and systematic calculations from the MIE theory, were calculated for different empirical drop size distributions. (Author)

encountered in the AN/TCC-7 white noise tests are also discussed. Controlled impulse noise tests were conducted. The results show that of the various modems tested thus far, the vsb modem is the most susceptible to impulse noise. The results are depicted in curves of bit error rate vs. rms signal to peak-to-peak noise ratio. A photograph of the controlled impulse used for the test is presented. A system for recording impulses encountered in field testing and how it may help in the study of data transmission is discussed. The amplitude and delay characteristics of the AN/VRC-12 radio set are presented in graphical form. Also presented is a tabulation of the modem bench tests conducted over the AN/VRC-12 showing that the radio set may possibly perform very well as a digital data transmission link. Noise quieting curves of the AN/TRC-24 radio set are discussed and the performance of the various modems over the radio set operating near and on the FM threshold is reported. The results of field cable testing of the modems are presented in tabulated form with a more detailed discussion of hits and drop outs in this transmission link. (Author)

AD-282 967 Div. 5
(TISTW/RD) OTS price $9.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
BANDWIDTH LIMITING EFFECTS OF FREQUENCY SELECTIVE FADING OVER TROPOSPHERIC SCATTER PATHS.
Master's thesis,
by Paul David Shaft. 12 Dec 61, 105p. incl. illus. tables, 28 refs. (Research rept. no. PIBMRI-976-61)
(Contract AF 18(600)1505)
(AFOSR-1970) Unclassified report

DESCRIPTORS: *Telephone signals, *Telegraph signals, *Voice communication systems, *Radio transmission, Diversity reception, Scattering, Multiplex transmission, Distortion, Frequency dividers, Frequency modulation, Atmosphere, Attenuation.

A set of design curves of intermodulation distortion due to frequency selective fading was derived for tropospheric scatter systems. These curves are applicable to systems frequency modulated with frequency division multiplexed telephone and telegraph channels. The reduction in distortion due to the use of diversity reception was not calculated, but a general discussion of some of the problems involved in determining the reduction is given. A two-ray model was selected to derive general results. This, however, restricts the use of the design curves to the region where the information bandwidth is less than the propagation bandwidth. Equations for intermodulation distortion are evaluated using the parameter normally encountered in tropospheric scatter systems. A method of obtaining a probability distribution of distortion is indicated, and an example is worked out in detail. The design curves are compared to experimental measurements of intermodulation distortion due to propagation and agree to a first order approximation. The principal result is the development of design curves which can be used to predict the intermodulation distortion introduced by the tropospheric scatter medium. The intermodulation distortion will exceed thermal noise in many systems. (Author)

AD-283 079 Div. 5
(TISTE/CAM) OTS price $1.10

Babcock Electronics Corp., Costa Mesa, Calif.
RECEIVING SET, RADIO AN/ARW-67A.
Final engineering rept. 20 July 62, 4p. illus. (BEC rept. no. 841)
(Contract NOw 61-0422-i)
Unclassified report

DESCRIPTORS: *Radio receivers, *Radio communication systems, *Remote control systems, Ultrahigh frequency, Frequency modulation, Audiofrequency, Audio amplifiers, Acoustic filters, Electronic relays, Radiofrequency amplifiers, Intermediate frequency amplifiers, Oscillator circuits, Broadband, Airborne, Life expectancy, Test methods.

The development of a high quality, non-expendable, remotely tunable 406 to 420 mc FM radio control receiver was completed. This receiver is to be employed in piloted aircraft to permit radio control of certain flight and operation functions related to specific military missions. Laboratory, environmental, RF interference and life tests disclosed that the receiving set, possesses excellent reliability characteristics. In performing these tests, the equipment maintained high sensitivity operation and performed well within specified limits. (Author)

## 6. DETECTION

AD-281 751 Div. 6, 15
(TISTP/WH) OTS price $1.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
AN ACQUIRABLE CODE,
by Edwin Weiss and Daniel Gorenstein. 9 July 62, 8p. 3 refs. (Rept. no. 55 G-2)
(Contract AF 19(628)500)
(AFESD TDR 62-105) Unclassified report

DESCRIPTORS: *Radar ranges, *Phase measurement, *Algebras, *Correlation techniques.

The problem of range measurement for vehicles in space is usually treated within the following framework. At the ground one transmits continuously a single sequence of very long period. This is received at the vehicle and retransmitted. Thus, at the ground a corrupted and out-of-phase version of the original sequence is received. By operating on it (usually by correlation techniques) one hopes to determine the phase, and then by measuring the elapsed time to find the distance in question (without ambiguity in virtue of the long period of the sequence). Such a sequence is known as an acquirable code. An elegant (though elementary) mathematical procedure is described for selecting an acquirable code; it rests on well-known properties of maximal length shift register sequences and on the Chinese Remainder Theorem. (Author)

AD-281 809 Div. 6
(TISTB/AW) OTS price $10.10

Visibility Lab., U. of Calif., San Diego.
A STUDY OF THE FACTORS AFFECTING THE SIGHTING OF SURFACE VESSELS FROM AIRCRAFT,
by William Hadley Richardson. June 62, 120p. incl. illus. tables, 25 refs. (SIO reference no. 62-13)
(Contract NObs-72092)
Unclassified report

DESCRIPTORS: *Visibility, *Oceanography, *Detection, Range finding, Aircraft, Coast Guard, Visual thresholds, Marine meteorology, Clouds, Wind, Sun, Wake, Ships.

model, uncovered many problem areas which included the collecting optics, the detector spectral selectivity, and temperature control of the reference source. A 15 micron sensitive free air thermometer was subjected to ground testing to establish techniques needed for the design of a model radiometer for supersonic flight.

AD-282 785 Div. 6
(TISTW/DLW) OTS price $15.00

Engineering Development Lab., Naval Air Development Center, Johnsville, Pa.
DETERMINATION OF THE UHF MULTICARRIER TELEMETRY ASSIGNMENTS,
by Nicholas J. Doto. 1962, 16p., 199p. of tables, 3 refs. (Rept. no. NADC-ED-6122)
Unclassified report

DESCRIPTORS: *Telemeter systems, Radiofrequency, *Radio interference, Multiple operations, Modulation, Frequency, Nonlinear systems, Determination, Ultra high frequency, Mathematical analysis, Channel selectors, Reduction.

The simultaneous operation of several telemetry carriers can result in an additional form of interference (intermodulation interference) as well as the more common forms such as adjacent-channel and spurious interference. Intermodulation interference, resulting from third- and fifth-order intermodulation products formed by nonlinear operations occurring in transmitting or receiving systems, can be made to fall on unused channels by judicious selection of simultaneously operating channels from a band of uniformly spaced channels. The method is discussed for selection of frequencies for multicarrier operations. Tables developed from computer runs are included listing groups of 4 channels in a band of 40, groups of 4 in a band of 100, and groups of 5 in a band of 40, which are free of intermodulation interference. In addition, the difference triangle is introduced as an alternate method for determining a small number of groups in the absence of tables. (Author)

AD-282 869 Div. 6
(TISTW/RD) OTS price $1.60

Anti-Submarine Warfare Lab., Naval Air Development Center, Johnsville, Pa.
DESIGN OF AUDIO CONTROL AND MONITOR PANELS FOR ASW FLIGHT TEST PURPOSES.
Phase rept.,
by P. Haas. 2 Aug 62, 10p. incl. illus. (Rept. no. NADC-AW-6204)
Unclassified report

DESCRIPTORS: *Control panels, *Monitors, Audiofrequency, Radio receivers, Airborne, Naval aircraft, Flight testing, Recording devices, Interphones, Radio sono buoys, Sonar signals, Antisubmarine warfare.

An audio control panel and project monitor panels were developed to meet the demands for a convenient and efficient means of routing and recording the audio information derived from the various project receivers aboard a P2V-7 aircraft, and to aid project personnel and coordinating their efforts during test flights. The following features were incorporated in the audio control panel: (1) The patching network was enlarged over that used in the previous audio panel; (2) Each tape recorder input was preceded by a step attenuator; (3) A built-in volume level meter was installed to permit the reading of input levels on all recording channels; (4) For playback signal level control and measurement reference, facility was provided for application of a calibration signal to all recorder channels at any time; and (5) The project personnel can monitor any of the inputs to all recorder channels. The tape may also be monitored by means of a downstream reproduction system to check the quality of the recording. By means of auxiliary project monitor panels, the project group is provided with an interphone system that may be operated separately from the regular aircraft intercommunication system (ICS). (Author)

AD-282 981 Div. 6, 2
(TISTW/DLW) OTS price $2.60

Stanford Research Inst., Menlo Park, Calif.
AN ANALYSIS OF THE OUTGOING INFRARED RADIATION AT OMAHA, NEBRASKA, 12-16 MARCH 1957,
by P. M. Furukawa and W. Viezee. July 62, 25p. incl. illus. tables, 22 refs. (Scientific rept. no. 1)
(Contract AF 19(628)322, Proj. 6698)
(AFCRL 62-678) Unclassified report

DESCRIPTORS: *Infrared radiation, *Satellite vehicles, Wave transmission, Absorption, Intensity, Nebraska, Clouds, Measurement, Infrared spectroscopy, Water vapor, Atmosphere, Meteorological instruments.

The spectrally integrated outgoing intensities at the top of the atmosphere and the distributions of the atmospheric contributions to these intensities were calculated for a selected four-day period at Omaha, Nebraska. The calculations were made for two spectral intervals corresponding to the approximate bandwidths of Channels 1 (6.0-6.5 microns) and 2 (8-12 microns) of the Tiros II radiometer. The methods of calculation are fully described. The results are discussed and presented in the form of four-day time sections. (Author)

AD-282 991 Div. 6
(TISTP/WH) OTS price $1.10

Westinghouse Electric Corp., Pittsburgh, Pa.
UNDERWATER SOUND SCATTER STUDY.
Final rept.,
by D. D. Skinner. 15 Aug 62, 8p. (Research rept. no. 62-914-436-R1)
(Contract Nonr-311800)
Unclassified report

DESCRIPTORS: *Underwater sound, *Sonar equipment, *Sonar targets, *Scattering, Echo ranging, Electronic equipment, Underwater cameras.

From the experimental data obtained, the following conclusions can be reached: (1) there is a high density of visible objects in the ocean; (2) fish, such as the Sea Herring, and small crustaceans such as the boreal euphausid are probably responsible for some of the sound scattering in areas where they are present; and (3) with the photographic techniques used, the smaller objects visible, which constitute the majority of the visible objects, are not identifiable. (Author)

AD-283 052 Div. 6, 25
(TISTW/DLW) OTS price $3.60

Electro-Optical Systems, Inc., Pasadena, Calif.
COHERENT OPTICAL SURVEILLANCE DEVICES,
by Richard E. Bradbury. 1 June 62, 25p. incl. illus. tables (EOS rept. no. 2230-Q-1)
(Contract AF 30(602)2710)
(RADC TDR 62-292) Unclassified report

DESCRIPTORS: *Phase shifters, *Lasers, Light transmission, Reflection, Gases, Optical equipment, Quartz, Detectors, Design, Calibration, Photomultipliers, Light.

# Division 6 - DETECTION

AD-282 443 Div. 6, 8
(TISTW/PCR) OTS price $6.60

Army Ordnance Missile Command, Redstone Arsenal, Huntsville, Ala.
TESTS OF RADIO-FREQUENCY ATTENUATION DEVICES. TEST PERIOD: SEPTEMBER AND OCTOBER 1961,
by James McAdams and R. L. Langston. 9 Feb 62, 62p. incl. illus. table, 2 refs. (Rept. no. TN2J181-2)
(DA Proj. 516-04-007)
Unclassified report

DESCRIPTORS: *Radiofrequency attenuators, *Shielding, Rubber, Nickel alloys, Beryllium alloys, Copper alloys, Waveguides, Guided missile detection, Guided missiles (Surface to air).

Attenuation test results from four radio-frequency shielding devices installed on a personnel door of an RF-shielded room are covered. An overlapping surface hatch door was utilized in these tests. The shielding devices tested were: (1) Monel mesh braided over neoprene rubber tubing, (2) beryllium copper finger stock, (3) copper mesh over Tygon tubing, and (4) wave guide cavities. Satisfactory shielding was obtained with the beryllium copper finger stock device and with the copper mesh over Tygon tubing device; the endurance properties of the copper mesh over Tygon tubing device were determined to be inadequate. (Author)

AD-282 528 Div. 6, 8
(TISTW/PCR) OTS price $8.10

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
ELECTRONIC EQUIPMENT INTERFERENCE CHARACTERISTICS-- COMMUNICATION TYPE.
Quarterly rept. no. 5, 1 Mar-31 May 62,
by R. N. Bailey, J. G. Holey, and E. W. Wood. 31 May 62, 73p. incl. illus. tables, 10 refs.
(Rept. no. 19)
(Contract DA 36-039-sc-87183, Proj. 3X90-90-004)
Unclassified report

DESCRIPTORS: *Radio interference, *Military communications, *Radio communication systems, Pulse communication systems, Harmonic analysis, Modulation, Frequency modulation, Diodes, Radiofrequency amplifiers, Signal-to-noise ratio, Electronic equipment.

The spectra of harmonics of modulated signals are discussed and illustrated with photographs. It is concluded that the spectrum of a harmonic for the typical transmitter is influenced greatly by transmitter tuning. Errors in the measurement of spurious and harmonic emissions are discussed and methods are given for data verification and preclusion of errors. Factors which affect spurious responses and some techniques for their reduction are briefly discussed. A carrier cancellation technique for extending the dynamic range of spectrum analyzers is proposed. Complete design and test information are given. Experimental results using the carrier cancellation device for measurement of carrier noise and sideband splatter are discussed and illustrated. It is concluded that use of this technique results in an effective increase in spectrum analyzer dynamic range to more than eighty decibels. (Author)

AD-282 600 Div. 6, 25
(TISTW/RD) OTS price $11.00

Lockheed Aircraft Corp., Sunnyvale, Calif.
SPECTRAL AND TOTAL EMISSIVITY APPARATUS AND MEASUREMENTS OF OPAQUE SOLIDS,
by Clyde C. Shaw, James C. Berry, and Thomas W. Lee. 10 Mar 59, 1v. incl. illus. table, 8 refs.
(Rept. no. LMSD 48488)
(Contract AF 04(647)97)
Unclassified report

DESCRIPTORS: *Thermal radiation, *Blackbody radiation, *Infrared radiation, Thermodynamics, Hemispherical shells, Heat transfer, Optical systems, Reflection, Spectrophotometers, Reflectometers, Rotating structures, Mirrors, Solids.

Three methods of measuring the normal spectral, total normal and total hemispherical emissivity of opaque solid materials are described. Spectral emissivity measurements are performed at approximately ambient temperature and encompass the wavelength interval .4 to 25 microns. Total hemispherical emissivity measurements cover the temperature range 0 C to 600 C. Results of the emissivity measurements, of various materials, as performed with each of the systems, are presented. (Author)

AD-282 618 Div. 6, 1
(TISTA/GEC) OTS price $4.60

4750th Test Squadron (Tactics and Application Engineering) Tyndall Air Force Base, Fla.
F-101B PILOT'S ''B'' SCOPE.
Final technical rept.,
by Frederick J. Trost, Jr. 5 May 62, 48p. incl. illus.
(Proj. ADC/73AD/61-18)
Unclassified report

DESCRIPTORS: *Radar repeaters, *Display systems, Jet fighters, Electronic equipment, Aircraft equipment, Flight testing, Aircraft fire control systems, Radar equipment.

The improvement of the training capability of the F-101B for the Interceptor Weapons School, by replacing the normal pilot's attack scope with a radar intercept observer's scope was undertaken. The theory was to utilize the 466-179-110 box, similar to that in a TF-102, to serve as a junction and signal divider for both radar scopes. The modification was completed and successfully test flown. The pilot has a choice of the following presentations: 'B' sweep at all times, and a choice of 'A' scope or normal pilot's display. The radar observer has a choice of the following presentations: 'B' sweep at all times, and a choice of 'A' scope, normal display (Data Link or Elevation Marker), or attack display. (Author)

AD-282 739 Div. 6, 2
(TISTW/DLW) OTS price $3.60

Barnes Engineering Co., Stamford, Conn.
FREE AIR THERMOMETER EVALUATION AND PREPRODUCTION.
Final engineering rept. on Infra-red and Electro-Optics,
by A. C. Rudomanski. July 62, 34p. incl. illus.
(Rept. no. 4234)
(Contract NOa(s) 59-6114-c)
Unclassified report

DESCRIPTORS: *Radiometers, *Thermometers, *Infrared detectors, *Supersonic flight, Meteorological instruments, Infrared equipment, Absorption, Airborne, Sensitivity, Temperature, Atmosphere, Measurement, Temperature sensitive elements, Air, Air mass analysis.

The feasibility was studied of measuring free air temperature radiometrically from supersonic aircraft. The investigation, which included the construction and testing of a breadboard

have been delivered to the Flight Accessories Laboratory, Aeronautical Systems Division. Each panel contains 153 n-type PbTe elements and 153 p-type ZnSb elements, arranged in eighteen alternating rows of seventeen elements each. According to measurements made on test panels constructed in a similar fashion, the delivered panels are capable of an output of at least 1.33 w/sq ft when subjected to an incident energy of 1400 w/sq m, which is equal to the solar energy intensity at the Earth's distance from the sun. At this output, the solar panel weighs 96 pounds per electrical kilowatt. The observed ouput is lower than is calculated from the properties of the materials used; however, it is anticipated that improved performance can be obtained in future panels. (Author)

AD-282 294 Div. 7
(TISTM/GEC) OTS price $2.60

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
FUEL CELL POWER PACK.
Engineering research study rept. on Phase 1, 11 Dec 61-30 June 62.
30 July 62, 19p. illus.
(Contract DA 49-186-502-ORD-1057)
Unclassified report

DESCRIPTORS: *Fuel cells, *Power supplies, Air cooled, Hydrogen, Gases, Oxygen, Electrodes, Nickel, Electrolytes, Potassium compounds, Hydroxides, Chemical reactions, Electrochemistry, Gas flow, Instrumentation, Pressure, Temperature, Design, Electric power production.

A 1.5 kw experimental fuel cell system was designed and constructed. The hydrogen-oxygen fuel cell is an air cooled unit rated at 500 w at 12 v. It consists of 15 individual cells connected in series with each cell having an area of 0.489 sq ft. (Author)

AD-282 354 Div. 7, 8
(TISTP/FR) OTS price $3.60

Armour Research Foundation, Chicago, Ill.
TWO-CONDUCTOR LOW-PASS TRANSMISSION LINE THEORY.
Quarterly rept. no. 4,
by H. G. Tobin. 25 June 62, 27p. (Rept. no. ARF 5167-Q4)
(Contract N178-7927)
Unclassified report

DESCRIPTORS: *Transmission lines, Low pass filters, Coaxial cables, Ferrites, Polymers.

Transmission lines which utilize a disperse dielectric were fabricated as experimental, laboratory models and the attenuation of these lines measured. Indications are that certain of the dielectrics used have a resistivity which is a strong function of frequency. Measurements were also made upon ferrite rods for use in the transmission lines which indicate that these rods also have a frequency dependence. The attenuation of the samples tested exhibited a similar behavior to the lines incorporating the disperse dielectric. Incomplete analyses were made of lines which incorporate periodic lump-loading and upon lines which have a center conductor which is helically wound. Of concern in this latter case was the effect of the interturn capacitance upon the high frequency behavior of the line. Preliminary indications are that this capacitance will not cause any deleterious resonance effects until frequencies high enough such that the line model considered is probably no longer valid. The complexity of the expression for the attenuation for both of these lines will probably eliminate any hope of obtaining a theoretical design optimum. (Author)

AD-282 389 Div. 7
(TISTE/CDM) OTS price $3.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
LIGHTWEIGHT, EXTREMELY HIGH-POWER ELECTRICAL SOURCES,
by Donald A. DeMoulin and John H. Granger.
5 May 62, 28p. incl. illus. tables, 30 refs.
(MEWD rept. no. 1129)
Unclassified report

DESCRIPTORS: *Electric power production, *Power supplies, Electrostatic generators, Fuel cells, Magnetohydrodynamics, Thermoelectricity, Generators, Storage batteries, Primary batteries, Gas turbines.

Contents:
Theoretical limitation of energy sources
Prime power sources
Batteries
Turbine-reduction gear-generator sets for ac or dc power
Thermionic converters
Thermoelectric generators
Magnetohydrodynamic generators
Fuel cells
Electrostatic generators

AD-282 390 Div. 7
(TISTM/ODN) OTS price $4.60

Gulton Industries, Inc., Metuchen, N. J.
STATE OF CHARGE INDICATORS FOR ALKALINE BATTERIES.
Quarterly technical progress rept. no. 2,
by M. Lurie and H. N. Seiger. 15 Aug 62, 38p. incl. illus. tables.
(Contract AF 33(657)8130, Proj. 3145)
Unclassified report

DESCRIPTORS: *Alkaline cells, *Pulse analyzers, *Electrostatic capacitance, Oscilloscopes, Resistance, Electric currents, Voltage, Electrical double layers, Electronic switches, Oscillators, Tests, Ionic current.

The work described has been divided into two major categories: Pulse Techniques and Phase Techniques. For the pulse techniques, a load was connected to a test cell through an appropriate switch so that the current was suddenly increased from zero to the required value. These values changed from C/2 to 100C on 4 Amp-Hr cells. The parameters being studied were displayed on an oscilloscope and a photographic record made. Results of the transient peak height measurements have been inconsistent. The height shows a somewhat random variation although there is a general decrease in transient peak height with decreasing capacity. The ohmic resistance shows a capacity dependence. The double layer capacitance varied with state of charge but the lack of reproducibility of the measurements caused errors in predicting the state of charge that were too large to be acceptable. Two successive refinements in the apparatus failed to reduce this error appreciably. The phase techniques rely on the measurement of the shift in phase between the cell voltage and current. It appears that with the phase method a battery would have to be tested cell by cell. With the resistance method an entire battery could be checked with one measurement by bringing all cell terminals to a common multi-pin connector on the battery. (Author)

AD-282 423 Div. 7
(TISTM/EJH) OTS price $6.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
HYDROGEN-OXYGEN PRIMARY EXTRATERRESTRIAL (HOPE)

Research concerned the development of coherent optical components operative over the spectral range from 0.5 to 0.8 microns. Design considerations were made and designs finalized for a gas cell variable phase shifter to provide 180 degrees phase shift of light at 7000 angstroms with a sensitivity of better than 1 degree. A study of the relative merits of double beam and multiple beam methods of calibrating the phase shifter using incoherent light was made. A survey of photomultiplier tubes was made to select that tube which will be most useful for calibration and evaluation purposes. (Author)

# 7. ELECTRICAL EQUIPMENT

AD-281 805 Div. 7, 4
(TISTM/EJH) OTS price $.75

Politecnico di Milano (Italy).
RESEARCHES ON HYDROGEN OVERVOLTAGE ON METALLIC SINGLE CRYSTALS.
Rept. for 1 July 60-30 June 61, on Hydrogen Evolution,
by R. Piontelli, L. Peraldo Bicelli and others.
May 62, 26p. incl. illus. tables, 11 refs.
(Contract AF 61(052)144, Proj. 7353)
(ASD TDR 62-357) Unclassified report

DESCRIPTORS: *Electrodes, *Crystals, *Single crystals, *Metallic crystals, Electrochemistry, Voltage, Hydrogen, Surfaces, Crystal structure, Silver electrodes, Copper electrodes, Cadmium, Bismuth, Antimony, Gold, Tin, Zinc, Lead, Nickel electrodes.

The influence of crystallographic orientation of electrode surfaces on hydrogen overvoltage was investigated. The single and polycrystalline electrodes studied included Cd, Bi, Sb, An, Sn, Zn, Pb and Ni electrodes. (Author)

AD-281 842 Div. 7, 14
(TISTM/EJH) OTS price $4.60

Diamond Ordnance Fuze Labs., Washington, D. C.
VACUUM DEPOSITED INDIUM FILMS, PROPERTIES AND USE AS FUSIBLE ELEMENTS FOR THERMAL BATTERIES,
by L. H. Bullis and W. C. Boesman. 2 July 62, 42p. incl. illus. tables, 27 refs. (Rept. no. TR-1047)
(Proj. 96391)
Unclassified report

DESCRIPTORS: *Power supplies, *Primary batteries, *Thin films, *Indium, *Metal films, Metallic smoke deposits, Vapor plating, Mica, Storage, Resistance, Test methods, Melting, Temperature.

Need for a means of determining whether a thermal battery had been accidentally activated prior to its installation in a piece of equipment led to an investigation of thin metal films that melt at temperatures between 100 and 200 C, and have high resistances after and low resistances before melting. Indium films in thicknesses ranging from 200 to 5300 angstroms were vacuum-deposited onto mica substrates. Prior to melting at 156 C, these films were continuous and exhibited low resistance (less than 1 ohm). On melting, the films agglomerated into discrete particles, because indium will not wet mica, and high resistances (less than 1 ohm) were obtained. Thus, satisfactory elements were obtained on mica. (Author)

AD-282 174 Div. 7
(TISTM/MS) OTS price $5.60

Union Carbide Consumer Products Co., Cleveland, Ohio.
LOW TEMPERATURE BA-2270/U BATTERIES.
Final rept., 1 Nov 56-31 May 62,
by D. G. Soltis and E. J. Zeitz. 31 May 62, 54p. incl. illus. tables, refs.
(Contract DA -039-sc-73092)
Unclassified report

DESCRIPTORS: *Dry cells, *Bias batteries, *Low temperature batteries, *Electrolytic cells, *Cathodes (Electrolytic cell), Arctic regions, Temperature, Storage batteries, Design, Construction.

This report includes:
THE DETERMINATIONS OF THE COEFFICIENT OF THERMAL CONTRACTION OF BATTERY COMPONENTS, by H. D. Yarian. 2 Apr 58, 4p. incl. table (Rept. DTM-47)

The BA-2270/U battery in the Cathodic Envelope construction gives an actual initial low temperature service level equivalent to 4 times that obtained under other contracts using conventional constructions. Increased electrode area and more intimate contact between materials of construction over the entire operating temperature range have been the prime factors giving this higher service level. High electrolyte solution volumes, higher concentrations of active ore and positive sealing of cells have also contributed to the service advantage. (Author)

AD-282 178 Div. 7
(TISTM/GEC) OTS price $5.60

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
DESIGN OF 400 WATT HYDROGEN OXYGEN CAPILLARY TYPE FUEL CELL.
Quarterly technical progress rept. no. 1, 15 May-15 July 62.
15 Aug 62, 22p. incl. illus.
(Contract AF 33(657)8970, Proj. 3145)
Unclassified report

DESCRIPTORS: *Fuel cells, *Power supplies, Hydrogen, Oxygen, Electrodes, Control, Feasibility studies, Capillary tubes, Tests, Catalysts, Potassium compounds, Hydroxides, Electrolytes, Voltage, Vapor pressure, Electrochemistry, Design, Electric power production.

The design of a hydrogen-oxygen fuel cell system was undertaken. The fuel cell module design was finalized and space oriented components were fabricated for feasibility tests. (Author)

AD-282 213 Div. 7
(TISTP/FR) OTS price $1.50

General Atomic Div., General Dynamics Corp., San Diego, Calif.
FLAT-PLATE SOLAR THERMOELECTRIC CONVERSION PANELS.
Final rept., Nov 60-Dec 61,
by Arthur N. Himle, Daniel S. Brush and others.
May 62, 47p. incl. illus. tables, 3 refs.
(Contract AF 33(616)7676, Proj. 8173)
(ASD TDR 62-214) Unclassified report

DESCRIPTORS: *Thermoelectricity, *Power supplies, *Sandwich panels, Aluminum, Lead compounds, Tellurides, Zinc compounds, Antimonides, Solar energy.

Procedures were developed for constructing a lightweight solar energy converter, using thermoelectric materials sandwiched between flat sheets of aluminum. Two panels, each one foot square,

COUPLING FOR SPACE POWER TRANSMISSION.
Quarterly progress no. 1, 21 May-27 July 62,
by C. S. Nau. Aug 62, 110p. incl. illus. tables,
4 refs. (Rept. no. ER-4956)
(Contract AF 33(657)8486)
Unclassified report

DESCRIPTORS: *Liquid metals, *Transmissions, *Auxiliary power plants, *Hydraulic seals, *Vapors, Hydraulic fluids, Sodium, Rubidium.

A one to one speed ratio hermetically sealed coupling for a 15 KW, 24,000 rpm unit is to be developed and the problems encountered in scaling the unit from 15 KW to 3 KW and 3000 KW are to be evaluated. The design requirements provide for power transmission through a continuous boundary with a device having a 90% over-all efficiency and 10,000 hours of maintenance-free design life. Operating conditions will be 20 to 40 psi pressure differential, 1000 F potassium or rubidium vapor on one side of the boundary, and 1/100,000 mm Hg vacuum at the same temperature on the opposite side. Both a deformable membrane and a magnetic coupling will be evaluated experimentally. One of the two devices will be selected for a 1000 hour endurance test. (Author)

AD-282 718 Div. 7
(TISTE/CDM) OTS price $2.75

General Electric Co., West Lynn, Mass.
VOLTAGE REGULATION AND POWER STABILITY IN UNCONVENTIONAL ELECTRICAL GENERATOR SYSTEMS.
Quarterly technical progress rept. no. 3,
31 Dec 60-31 Mar 61.
31 Mar 61, 139p. incl. illus. tables.
(Contract Now 60-0824-c)
Unclassified report

DESCRIPTORS: *Voltage regulators, *Electric power production, *Power supplies, *Fuel cells, *Generators, *Thermoelectricity, *Thermionic emission, Switching circuits, Control systems, Transistors, Direct current, Inverted rectifiers, Solid state physics, Inverter circuits, Electronic circuits, Sources, Voltage, Impedance, Design, Tests.

Research continued on voltage regulation and power stability in unconventional electrical generator systems. Test data on the internal impedance characteristics of a fuel cell are presented. Steady state volt-ampere characteristics of both thermoelectric and thermionic generators are given. An analysis of series-parallel switching methods of voltage control is included. The results to date of a survey of applicable power conversion circuits using power transistors and silicon controlled rectifiers is given. Progress to date in the experimental investigation of efficient power conversion circuits using an input voltage of one volt is presented. (Author)

AD-282 723 Div. 7
(TISTM/GEC) OTS price $1.00

Melpar, Inc., Falls Church, Va.
A THIN-PLATE BATTERY.
Supplement to Quarterly rept. no. 9, 15 May-15 Aug 62 on Molecular Circuit Development,
by J. F. Ambrose and J. Smit. 15 Aug 62, 32p.
incl. illus. table.
(Contract NOw 60-0362-c)
Unclassified report

DESCRIPTORS: *Storage batteries, *Wet cells, Design, Manufacturing methods, Electrolytes, Ammonia, Cathodes (Electrolytic cells), Nitrobenzenes, Anodes (Electrolytic cells), Lithium, Magnesium, Encapsulation, Filament wound construction, Glass textiles, Binders, Epoxy resins, Amides, Tests, Pressure.

Feasibility studies on miniaturizing the NOLC liquid activated ammonia cell continued. The requirements of a high-energy-density battery delimit packaging, and encompass both the energy-weight density and the energy-volume density of power sources. The specifications demand high drain rates for 6 to 10 min. through 10% voltage regulation within the military range of operating temperature. The cell is composed of an organic cathode (metadinitrobenzene) and a light, active metal anode, such as Mg or Li. The electrolytic solution for this system contains liquid ammonia as the solvent. The energy content of this system is adequate; the anodic materials are light in weight and high in potential; and the low-temperature range of the liquid solvent extends beyond the military operating range. The design and fabrication of an encapsulated battery unit was completed. (Author)

AD-282 847 Div. 7, 8
(TISTP/TL) OTS price $3.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THEORETICAL STUDY OF A CLASS OF LOGARITHMICALLY PERIODIC CIRCUITS,
by Raj. Mittra. July 62, 25p. incl. illus.
5 refs. (Technical rept. no. 59)
(Contract AF 33(657)8460, Proj. 6278)
Unclassified report

DESCRIPTORS: *Circuits, *Transmission lines, *Electrical networks, *Dipole antennas, Sequences, Sampling, Impedance, Numerical analysis.

Closed-form expressions for lumped Foster type LP circuits were derived. The characteristic equation for an infinite log-periodically-loaded transmission line was derived, and a method of solution of the above equation is discussed. A general approach towards studying a class of LP structures in terms of the Brillouin (k-beta) diagrams of the corresponding simply periodic structures is presented. (Author)

AD-282 862 Div. 7
(TISTM/MS) OTS price $2.25

Monsanto Research Corp., Everett, Mass.
COMPACT POWER FUEL CELL.
Rept. for 10 Dec 60-9 Dec 61, on Energy Conversion Techniques,
by John O. Smith, Ralph G. Gentile and others.
June 62, 78p. incl. illus. tables, 7 refs.
(Contract AF 33(616)7735, Proj. 3145)
(ASD TDR 62-42) Unclassified report

DESCRIPTORS: *Fuel cells, *Electrolytic cells, Electrical equipment, Electric power production.

A fuel cell battery was built meeting the contract specifications, namely, generation of 15 watts at 5 amperes for 8 hours utilizing hydrazine (5M in 10M KOH) as fuel and nitric acid (10M) as oxidant. The battery consisted of 3 cells each having an electrode area of 120 sq cm. The open circuit voltage was 5.95 volts. Over the 8-hour period the total current was just over 5 amperes at an operating voltage of about 4 volts. The battery produced 35 watt-hours/pound. Pentaborane and hydrogen peroxide were also tested as fuel and oxidant, respectively, with each other and with hydrazine and nitric acid. (Author)

AD-282 895 Div. 7
(TISTM/GEC) OTS price $8.10

Thermo Electron Engineering Corp., Waltham, Mass.
PARAMETRIC STUDY OF CLOSE-SPACED CESIUM THERMI-

FUEL CELL PROGRAM.
Quarterly technical progress rept. on Phase 1-a, 1 May-1 Aug 62,
by R. J. Barchet. 1 Aug 62, 62p. incl. illus. tables.
(Contract AF 33(657)9860, Proj. 6321)
Unclassified report

DESCRIPTORS: *Fuel cells, *Power supplies, Storage, Design, Packaging, Electronic circuits, Hydrogen, Oxygen, Voltage, Tests, Spaceships.

Fuel cell development tests were conducted with 4, 5, and 6 cell stacks, and with Module No. 2. The 6-cell stack life test was continued at 0.89 amps current for a total life of 1815 hours. A 5-cell stack was removed from 30 days active H2-02 storage and successfully completed a continuous 7 day test at 0.9 amps. current. A 4-cell stack was placed on sealed air - air inactive storage for a 30 day storage test. The 35 cell module was operated at various power levels up to 50 watts for 5-min periods. Output voltage at 50 watts was 27.6 volts. The module was also subjected to a series of performance stability tests. During these tests, the module was operated at ambient temperatures from 76 to 126 F and at heat sink temperatures from 84 to 120 F. Fuel cell controller block diagrams and circuit designs were completed. Breadboards were fabricated and are in test for the purge voltage sensing, purge sequencing, purge counter, purge timer reset and over-temperature load and fuel cutoff circuits. A purge voltage sensing and sequencing breadboard, fabricated from non-flight parts, was tested with the 35 cell module. Detailed mathematical simulation of the H and O compartments, and design of the handling sling were completed. (Author)

AD-282 474 Div. 7
(TISTA/GEC) OTS price $12.00

North American Aviation, Inc., Downey, Calif.
AUXILIARY POWER SOURCES IN SPACE: TECHNICAL DOCUMENTATION. VOLUME I. FUEL CELLS.
12 July 62, 156p. incl. illus. (Rept. no. SID 62-708)
Unclassified report

DESCRIPTORS: *Fuel cells, *Bibliography, *Power supplies, Oxidation reduction reactions, Hydrogen, Oxygen, Salts, Melting, Electrolytes, Ion exchange, Electrochemistry, Membranes, Auxiliary power plants.

This bibliographic search surveys the literature on fuel cells from 1950 to date, with special emphasis on hydrogen-oxygen, molten salt electrolytes, redox and ion membrane exchange types. (Author)

AD-282 505 Div. 7, 14
(TISTM/MS) OTS price $12.50

Westinghouse Electric Corp., Pittsburgh, Pa.
MODULE IMPROVEMENT PROGRAM.
Progress rept. no. 3.
15 Mar 62, 175p. incl. illus. tables.
(Contract NObs-84329)
Unclassified report

DESCRIPTORS: *Thermoelectricity, *Generators, *Electric power production, Thermal insulation, Refractory materials, Electric insulation, Refractory coatings, Organic coatings, High temperature research, Thermal conductivity, Electrical properties, Thermocouples, Mechanical properties, Flame spraying, Liquid metals, Stresses, Sheets, Silicone resins, Resins, Oxides, Aluminum compounds, Magnesium compounds, Mica, Adhesion, Surfaces, Test methods, Measurement, Materials.

Thorough examination of materials for use as core coatings has been narrowed to inorganic oxides, both in sheet form and in the form of plasma sprayed films. Properties of these materials are now being measured in the presence of actual production thermoelectric couples at temperatures likely to be encountered in generator operation. Exploratory investigations are also being made on materials such as porcelains and evaporated films of silicon monoxide. Mechanical properties of the power generation materials ZnSb, PbTe, and GeBiTe are being measured. A stress analysis for thermoelectric pellets and couples operating in a temperature gradient has been made. A report on encapsulation is included. This data will be useful for extending life and temperature as both material and couple fabrication is improved. (Author)

AD-282 547 Div. 7, 26
(TISTM/ODN) OTS price $5.60

National Cash Register Co., Dayton, Ohio.
FEASIBILITY INVESTIGATION OF CHEMICALLY SPRAYED THIN FILM PHOTOVOLTAIC CONVERTERS.
Quarterly rept. no. 2, 1 May-31 July 62,
by R. R. Chamberlin. 31 July 62, 1v. incl. illus. tables, 7 refs.
(Contract AF 33(657)7919)
Unclassified report

DESCRIPTORS: *Semiconductors, *Semiconducting films, *Photoelectric cells, Feasibility studies, Cadmium compounds, Manufacturing methods, Sulfides, Tin compounds, Indium, Gallium, Oxides, Crystals, Electron microscopy, X-ray diffraction analysis, Conductors, Indium compounds, Copper compounds, Materials, Electrodeposition, Copper electrodes, Gold electrodes, Coatings, Thin films.

The feasibility of a chemical spray process for its application to the fabrication of thin film photovoltaic converters using either CdS or CdSe as the semiconducting layer is being investigated. Evaluation of the semiconducting layer (CdS) and the initial work in fabricating a photovoltaic converter utilizing a barrier formed at the interface between a thin (.5 micron) film of CdS and a thin film (.05 micron) of Cu9-xS5(digenite) is reported. (Author)

AD-282 548 Div. 7
(TISTM/MS) OTS price $8.60

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
A DISCUSSION OF SOME ASPECTS OF ELECTRODE KINETICS RELEVANT TO FUEL CELL STUDIES,
by L. G. Austin. June 62, 66p. illus. 26 refs.
(Rept. no. 1)
(Contract DA 49-186-502-ORD-917)
Unclassified report

DESCRIPTORS: *Fuel cells, *Electrodes, Transport properties, Measurement, Mathematical analysis, Impurities, Chemical impurities, Chemical reactions, Electrolytes, Hydrogen electrodes, Electrochemistry, Kinetic theory.

Some aspects of electrode kinetics which would be of use to scientists and engineers working on fuel cells are presented. The report is intended as an introduction to the relevant theory of electrode kinetics and it does not give details of testing circuitry, nor does it review papers on electrode kinetics or fuel cell investigations. (Author)

AD-282 710 Div. 7
(TISTP/WH) OTS price $9.10

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
APPLIED RESEARCH ON A HERMETICALLY-SEALED DRIVE

# 8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-281 714 Div. 8, 25
(TISTP/WH) OTS price $2.60

Boeing Scientific Research Labs., Seattle, Wash.
ON THE INSTABILITY OF ELECTRON-HOLE PLASMAS IN A LONGITUDINAL MAGNETIC FIELD,
by O. Holter. July 62, 27p. incl. illus. 12 refs.
(Rept. no. D1-82-0183)
(In cooperation with Bergen U. (Norway))
Unclassified report

Also available from the author.

DESCRIPTORS: *Semiconductors, *Plasma oscillations, *Plasma physics, *Electrons, *Magnetic fields, *Electric fields, Oscillation.

The effect of a background of thermal holes has been included in a theory for the screw instability in electron-hole plasmas in a semiconductor. Our calculations are restricted to the case of low injection levels (injected current $\ll$ Ohmic current) in p-type material. The theory is developed along the general lines of previous works by different authors. Compared with experimental results, the theory predicts heating of the plasma to temperatures of the order of the optical phonon energy. (Author)

AD-281 741 Div. 8
(TISTE/CAM) OTS price $4.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
RESEARCH STUDIES ON PROBLEMS RELATED TO ANTENNAS.
Quarterly progress rept. no. 3, 1 Feb-31 May 62. 1 July 62, 36p. incl. illus.
(Contract AF 33(657)8460)
Unclassified report

DESCRIPTORS: *Antennas, *Helical antennas, *Dipole antennas, *Conical antennas, *Coupled antennas, *Lens antennas, Antenna radiation patterns, Helixes, Impedance, Electromagnetic waves, Wave transmission, Propagation, Focusing, Correlation techniques, Surface properties, Broadband, Equations, Taylor's series, Cerenkov radiation, Waveguides.

Contents:
Radiation from periodic structures
The backfire helical antenna
Log-periodic magnetic-current antennas
Log-spiral antennas
Simple arrays of conical spiral antennas
Impedance properties of curved wire antennas
Antenna impedance transforming networks
Collecting systems containing non-linear and/or active elements
Rectilinear spiral antennas
Wave propagation in helical structures
Investigation of tapered-period corrugated surface
Focusing of radiation from a bunched Cerenkov beam
Radiating lens illuminated from a Goubau beam-waveguide
Transmission between antennas when the far-field approximation does not apply
Zone phase plates

AD-281 742 Div. 8
(TISTW/DLW) OTS price $7.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
POLYGONAL SPIRAL ANTENNAS,
by C. H. Tang and O. L. McClelland. June 62, 57p. incl. illus. 21 refs. (Technical rept. no. 57)
(Contract AF 33(657)8460, Proj. 6278)
Unclassified report

DESCRIPTORS: *Helical antennas, *Conical antennas, Ultra high frequency, Broadband, Antennas, Helixes, Antenna radiation patterns, Design, Tests.

Literature on the problem of frequency independent antennas is reviewed. The main idea suggested was the relaxation of the similarity condition on the rigorous angular structures. The construction of polygonal spiral antennas is given in terms of the construction of the polygonal spiral curve. Through the construction the relation between the structure with the continuous similarity condition and that with discrete similarity condition is demonstrated. Experimental methods were used in determining the applicability of the polygonal spiral structure for the use of the frequency independent antenna. Measurement results showed that the rectangular spiral antenna is a good approximation to the log-spiral antenna, for two equivalent antennas of these types behave practically the same, as far as the frequency independent operation is concerned. Measurements were also made of a bifilar log-periodic zigzag antenna, a special case of the polygonal spiral antenna. (Author)

AD-281 752 Div. 8, 26
(TISTW/DLW) OTS price $3.60

Litton Electron Tube Corp., San Carlos, Calif.
ENGINEERING AND PRODUCTIZATION OF AN INTEGRATED FAMILY OF BACKWARD WAVE OSCILLATORS.
Interim technical engineering rept., 7 Jan-7 Apr 62,
by Benjamin V. Valles. 7 Apr 62, 33p. incl. illus.
(Contract AF 33(600)43396)
(AMC TR 7-652, vol. 3) Unclassified report

DESCRIPTORS: *Backward-wave oscillators, *Microwave oscillators, Electron tubes, Electron guns, Broadband, Life expectancy, Test methods, Manufacturing methods, Production, Ultra high frequency, Superhigh frequency, Design.

Emphasis was directed toward improvements in band 5 (3500-4850 mc) and band 7 (6500-8550 mc) tubes. Extensive electrical and environmental tests were conducted on these tubes to assure conformance to specifications. Material and technique changes which were developed to be applied to all bands are discussed. (Author)

AD-281 770 Div. 8, 15
(TISTP/TL) OTS price $6.60

Rochester U., N. Y.
IMPULSE RESPONSE OF LINEAR SYSTEMS USING CORRELATION AND DIRECT MEASUREMENT,
by Bertrand E. Berson. Aug 62, 58p. incl. illus. 17 refs.
(Contract Nonr-66817, Proj. NR 384-505)
Unclassified report

DESCRIPTORS: *Linear systems, *Statistical functions, *Correlation techniques, Sequences, Frequency, Measurement, Noise generators, Signals, Low pass filters, Integral transforms, Loudspeakers, Electrostatics, Taylor's series, Transformations (Mathematics) Integration.

If a pseudo-random noise sequence is used as the input to a linear system, then by suitably correlating the output of the system and a delayed version of the input, the impulse response of the system can be obtained. The effect of the finite size of the sequence auto-correlation

ONIC CONVERTERS.
Annual technical summary rept., 10 Apr 61-10 Mar 62,
by E. N. Carabateas, S. S. Kitrilakis, and J. H. Weinstein. May 62, 1v. incl. illus. tables.
(Contract AF 19(604)8453, Proj. 6692)
(AFCRL 62-669) Unclassified report

DESCRIPTORS: *Power supplies, *Diodes, Niobium, Molybdenum, Energy, Temperature control, Tests, Pressure, Measurement, Temperature, Thermal conductivity, Thermionic emission, Cesium.

A variable spacing, Cs diode test vehicle, using a Nb emitter and Mo collector, was used for parametric tests of converter performance. The design and construction of the test vehicle were such that emitter temperature, collector temperature, and Cs pressure could be independently controlled. In addition, most of the important converter heat losses could be accurately measured. Extensive tests were conducted which resulted in a complete map of diode performance which will greatly aid the selection of design conditions for future hardware manufacture. Additional tests were conducted to supply data for analytical work on Cs conduction, converter operation, and surface phenomena. (Author)

AD-282 985 Div. 7, 8
(TISTE/CAM) OTS price $5.60

Temco Electronics, Dallas, Tex.
SCR POWER INVERTER STUDY.
Quarterly progress rept. no. 2, 1 Oct 61-1 Jan 62,
by G. P. Underbrink. 15 Mar 62, 34p. incl. illus. tables, 7 refs. (Rept. no. 6017.04)
(Contract DA 36-039-sc-88965)
Unclassified report

DESCRIPTORS: *Rectifiers, *Commutators, *Electronic commutators, *Inverter circuits, *Inverted rectifiers, Electronic circuits, Silicon, Direct current, Alternating current, Oscillator circuits, Circuit breakers, Pulse transformers, Pulse generators, Electric relays, Transients, Reliability, Effectiveness, Theory, Circuits.

Research into the application of silicon controlled rectifiers to military power conversion requirements by improvement of techniques for SCR commutation and protection was continued. Analyses of commutation methods for controlled rectifier power inverters and new techniques for active SCR commutation are presented. Programmed starting methods to provide reliable commutation upon power application have been devised and protection methods using magnetic devices and SCR circuit breakers are considered. RFI and transient problems for SCR static converters are discussed. (Author)

AD-283 025 Div. 7
(TISTW/RD) OTS price $4.60

Ion Physics Corp., Burlington, Mass.
(No title).
Quarterly technical progress rept. no. 1, 1 Apr-15 July 62.
22 Aug 62, 41p. incl. illus. tables.
(Contract AF 33(616)7230, Proj. 0(3-3145))
Unclassified report

DESCRIPTORS: *Electrostatic generators, Electric power production, Electrostatic capacitance, Titanium, Electrodes, Thermionic emission, Rotor blades.

Several problems were encountered and corrected in the mechanical assembly of the 1 kw generator. Capacitance measurements were made on the generator, and the power stage values found to be close to the design values, although the floating rotor exciter stage capacitances are rather disappointing. The rotor/stator capacitance values have been checked for stability at generator speeds up to 6,000 rpm. Vacuum flashover checks on the generator insulation showed the stator insulation as designed carries the required voltage satisfactorily, but the rotor insulation requires improvement. The preliminary design of the 5 kw generator indicates that a straddle-supported rotor with a diameter of approximately 15 inches would make it just possible to generate 5 kw with a single rotor disc with a field of 80 kv/mm. Vacuum insulation studies included the preliminary stages of a program to determine the effect of dielectric coatings on vacuum breakdown. A field of 5 kv/mm has been supported with small area (15 sq cm) titanium electrodes. The first spinning cathode indirectly heated by a stationary heater has operated successfully. (Author)

AD-283 000 Div. 7, 8
(TISTE/CRJ) OTS price $9.60

Amphenol-Borg Electronics Corp., Chicago, Ill.
DEVELOPMENT AND PRODUCTION REFINEMENT OF MIL-C-26518(USAF) CONNECTOR, ELECTRICAL MINIATURE, RACK AND PANEL ENVIRONMENTAL RESISTING 200 C AMBIENT TEMPERATURE.
Final technical engineering rept., Mar 59-May 62,
by Carl H. Stuart. May 62, 106p. incl. illus. 15 refs.
(Contract AF 33(600)35971)
(ASD TR 62-7-625) Unclassified report

DESCRIPTORS: *Electric connectors, *Miniature electrical equipment, *Miniature electronic equipment, High temperature research, Manufacturing methods, Production, Airborne, Reliability, Temperature, Moisture, Maintenance, Vibration, High altitude, Design, Tests.

The MIL-C-26518(USAF) miniature connectors have established a new break-through in the electrical connector state-of-the-art. Miniaturization was achieved with major upgrading in connector serviceability, high altitude performance, moisture resistance, higher power transmitting capacity, high temperature performance and overall increase in connector reliability. The design steps and development measures taken to successfully integrate materials and design know-how are discussed. The work effort was directed primarily towards the refinement of this connector product, resulting in the finalization of a low resistance, close entry, crimp type, removable contact and a monoblock connector construction capable of meeting the extreme environments promulgated by the specification. Connector performance characteristics at high altitude, in salt water altitude immersion, environmental vibration, and deleterious fluid immersion are discussed along with supporting test data. (Author)

by Akira Ishimaru. Jan 62, 36p. incl. illus. 23 refs. (Technical rept. no. 63)
(Contract AF 19(604)4098, Proj. 5635)
(AFCRL 62-325) Unclassified report

DESCRIPTORS: *Antennas, *Antenna radiation patterns, *Series, Applied mathematics.

A new approach to the array problem is shown which is particularly suited for unequally spaced arrays with a large number of elements which may be located on a line or on a curve. It is shown that an unequally spaced array of uniform amplitude with any desired sidelobe level may be designed using our method. Also, the secondary beam suppression and the azimuth frequency scanning circular array was discussed to show the effectiveness of the method. Other applications including unequally spaced array on a travelling wave waveguide, the amplitude modulated antennas, the leaky-wave antennas, and the frequency scanning linear antennas are discussed. (Author)

AD-281 816 Div. 8
(TISTP/WH) OTS price $3.60

Washington U., Seattle. Coll. of Engineering.
THE EFFECT ON THE RADIATION FROM A PLASMA SHEATH OF A UNIDIRECTIONAL SURFACE WAVE ALONG A PERFECTLY CONDUCTING PLANE,
by Akira Ishimaru. Apr 62, 26p. incl. illus. table, 11 refs. (Technical rept. no. 64)
(Contract AF 19(604)4098, Proj. 5635)
(AFCRL 62-355) Unclassified report

DESCRIPTORS: *Plasma physics, *Electromagnetic waves, *Propagation, *Slot antennas.

When an anisotropic plasma is bounded by a conducting plane, a trapped surface wave can exist which propagates in a direction perpendicular to the dc magnetic field. When the plasma slab of finite thickness is placed over a conducting plane and excited by a magnetic line source which is in parallel with the dc magnetic field, this surface wave produces unidirectional leaky wave pole, and in a certain frequency range this leaky wave pole is very close to a saddle point. The radiation pattern which results from the saddle point evaluation has a very sharp peak and the angle of this main beam can be varied as the dc magnetic field or plasma frequency are varied. It is also interesting to note that this sharp beam exists even when a plasma is opaque. In fact a considerable amount of energy transmission through the opaque plasma is possible due to the effect of this particular leaky wave mode. (Author)

AD-281 841 Div. 8
(TISTP/FR) OTS price $.75

Diamond Ordnance Fuze Labs., Washington, D. C.
NUCLEAR RADIATION DAMAGE TO TRANSISTORS. VOLUME II. PERMANENT DAMAGE. PART 1. THEORETICAL ASPECTS,
by Martin J. Cooper and M. Gay Payne. 30 June 62, 33p. incl. tables, 14 refs. (Suppl. no. 1 to rept. no. TR-975)
(Proj. 23300)
Unclassified report

DESCRIPTORS: *Transistors, Radiation damage, Neutrons, Silicon, Germanium.

A mathematical analysis of neutron damage to transistors is presented. The approach involves statistical considerations of the variation of minority carrier lifetime tau thereby providing a direct calculation of the damage factor K, previously considered an empirical constant. It is thus possible to calculate the change of common-emitter current gain beta and collector leakage current (Ico) due to neutron exposure. Calculations agree reasonably well with experimental observations. (Author)

AD-281 843 Div. 8, 26
(TISTM/EJH) OTS price $4.60

Diamond Ordnance Fuze Labs., Washington, D. C.
MICROCIRCUITRY BY CHEMICAL DEPOSITION,
by Emma Lee Hebb. 22 June 62, 47p. incl. illus. tables, 18 refs. (Rept. no. TR-1052)
(Proj. 96392)
Unclassified report

DESCRIPTORS: *Subminiature electronic equipment, *Resistors, *Metal films, *Circuits, *Microminiaturization (Electronics), Chemical milling, Nickel alloys, Phosphorus alloys, Copper, Plating, Films, Manufacturing methods, Nickel plating.

Techniques for chemically depositing Ni alloy films on insulating substrates and for etching patterns in thin Cu conductors, were combined and modified to permit the fabrication of Ni alloy thin films in varied and controlled geometries. The resistivities of the films produced were varied from a few ohms per square to several thousand ohms per square, but, at present, tolerances on reproducibility limit the working range to a maximum of about 500 ohms per square. Resistive and conductive parts made of nickel alloy films of approximately 500 ohms per square have been employed in microcircuits in which the tolerances on resistance values are about ±30%. Although variations in films resistivity between batches sometimes exceeds these tolerances, the close agreement among films from the same batch and the ability to measure resistivities prior to committing films to circuit production allowed such circuits to be fabricated. Modifications of procedures to increase the reproducibility of resistance values are being investigated. (Author)

AD-281 867 Div. 8, 26
(TISTW/DLW) OTS price $3.50

Pacific Semiconductors, Inc., Lawndale, Calif.
PRODUCTION ENGINEERING MEASURE FOR VARIABLE CAPACITOR DIODES.
Final rept., 1 July 60-15 Apr 62,
by R. N. Clarke, ed. by G. A. Drown.
15 Apr 62, 199p. incl. illus. tables (PSI rept. no. 4000:8-F)
(Contract DA 36-039-sc-85942)
Unclassified report

DESCRIPTORS: *Variable capacitors, *Diodes, *Manufacturing methods, Modulators, Tuning devices, Production, Frequency modulation, Frequency stabilizers, Quality control, Design, Test methods.

The ability to mass-produce four types of voltage variable capacitors was established. The necessary mass-production techniques and production facilities were established to provide a production rate of 200 specification devices per 8-hour shift. New equipments were designed, developed, and manufactured which provide better control over the production processes, and, in addition, increased quality control measures were instituted where required. The delivery time for large numbers of voltage variable capacitors was decreased. (Author)

function upon the expected results is analytically determined. A system for making the measurements, including a simple method of obtaining a delayed sequence, is described. Measurements were made on low pass rc filters and comparisons made with the predicted results. A polarity-coincidence correlator was used. It was found that best results were obtained when the correlator output vs normalized correlation coefficient curve was assumed to be linear, although an accurate determination of the correlator characteristic could not be made. Finally, impulse response measurements were made on three speakers using correlation, direct pulsing and differentiation of the step response and the three methods compared. (Author)

AD-281 773 Div. 8
(TISTE/CDM) OTS price $3.60

Oklahoma State U. Research Foundation, Stillwater.
CALIBRATION AND FREE FIELD EVALUATION OF A PRESSURE GRADIENT MICROPHONE,
by George B. Thurston and Russell L. Heiserman.
July 62, 19p. illus. 9 refs.
(Contract Nonr-259503, Proj. NR 385-545)
Unclassified report

DESCRIPTORS: *Microphones, *Communication equipment, Design, Calibration, Tests, Pressure, Acoustics, Capacitors, Sensitivity, Errors, Mathematical analysis, Test methods.

The design, calibration procedure, and evaluation in a free field for a condenser type pressure gradient microphone are described. Procedures were carried out for determination of both magnitude and phase of the pressure gradient. The microphone responded to the differential action of the pressure at two closely spaced field points as communicated by two small probe tubes to either side of a sensing metal diaphragm. By means of a coupling chamber calibration procedure it was possible to obtain a sensitivity factor and an error factor which may be used both to describe the precision of the internal structure of the microphone as well as to correct for its imperfections. The free field studies analyzed the directional characteristics and resolution capabilities of the microphone. The radiation characteristics of a circular orifice in a plane baffle as measured with the gradient microphone are compared with those predicted by simple field theory with regard to the relationship between the pressure gradient magnitude and phase and the pressure magnitude and phase. (Author)

AD-281 796 Div. 8
(TISTP/FR) OTS price $2.25

Armour Research Foundation, Chicago, Ill.
SEMICONDUCTOR DIODE PERFORMANCE IN NUCLEAR RADIATION ENVIRONMENTS.
Final rept., 15 Apr 60-15 Aug 61 on ANP Airframe and Jet Oil Support,
by Harlan G. Hamre, Raymond C. Barrell, and William N. McElroy. May 62, 80p. incl. illus. tables, 21 refs.
(Contract AF 33(616)7329, Proj. 1448)
(ASD TDR 62-12) Unclassified report

DESCRIPTORS: *Diodes, Radiation damage, Fast neutrons, Tests, Instrumentation, Microwave equipment.

Performance characteristics were determined for two types of general purpose diodes, and for five types of microwave diodes, in radiation environments equivalent to at least 1000 hours' exposure to 10 to the 10th neutron/sq cm-sec and 2 times 10 to the 5th Rad/hour. None of the units studied showed satisfactory performance characteristics after this exposure, although the germanium 1N263 point-contact diode was degraded less than others investigated, and still exhibited measurable properties following the exposure. Results, although not conclusive, seem to indicate that energizing the microwave mixers at x-band (9375 Mc) during radiation is helpful in prolonging the life of the units. (Author)

AD-281 806 Div. 8, 2
(TISTP/WH) OTS price $4.60

Technical Research Group, East Boston, Mass.
MODES IN LOSSY STRATIFIED MEDIA WITH APPLICATION TO UNDERGROUND PROPAGATION OF RADIO WAVES,
by Mats E. Viggh. 20 Apr 62, 48p. incl. illus. 3 refs. (Scientific rept. no. 1)
(Contract AF 19(604)8057, Proj. 4600)
(AFCRL 62-399) Unclassified report

DESCRIPTORS: *Radio waves, *Electromagnetic waves, *Rock, *Propagation, Electrical properties, Dielectrics, Very low frequency, Low frequency, Medium frequency, High frequency, Very high frequency.

The problem considered is that of determining the complex propagation constant of a plane wave on a flat layer of lossy dielectric with a loss-tangent, less than one, and of uniform thickness, surrounded on both sides by identical layers having a loss-tangent greater than the skin depth. A formula given, relating this propagation constant to the path loss between two antennas provided their excitation efficiencies are known. Frequencies between 1 kc/s and 10 Mc/s are covered, as well as values on thickness of the middle layers ranging from 10 meters to 200 meters. (Author)

AD-281 810 Div. 8
(TISTP/FR) OTS price $2.60

Remington Rand Univac Div., Sperry Rand Corp., Philadelphia, Pa.
LOW POWER THIN MAGNETIC FILM MEMORY.
Interim engineering rept. no. 1, 5 Apr-5 July 62,
by T. J. Matcovich. 5 July 62, 14p. incl. illus. table.
(Contract AF 33(657)8679)
Unclassified report

DESCRIPTORS: *Thin films, *Metal films, *Memory devices, Electric insulation, Silicon compounds, Monoxides, Copper, Chromium alloys, Gold alloys, Nickel alloys, Iron alloys, Molybdenum alloys.

A substantial reduction in Hk was achieved by using Ni-Fe-Mo alloys. These alloys are electroplated directly onto 26-mil-thick copper substrates. Several multilayer evaporated circuits were deposited over the magnetic film. Difficulty was experienced with making good SiO insulating layers, but a solution to this problem has been found. Difficulty is still being experienced with making low resistivity conductors. The drive wires used are 0.020 inches wide. Equipment is being constructed for the evaporation of 0.005 inch drive wires. Spring loaded contacts from diode clips are being used to make contact to the plated wires. A technique was developed to cancel the unwanted signal capacitively coupled from the drive to the sense line. A single bit element was operated with a drive current of 140 mA, and gave an output signal of 0.4 mV with a signal to noise ratio of 4:1. Some samples have been prepared with evaporated digit lines. (Author)

AD-281 813 Div. 8
(TISTP/WH) OTS price $4.60

Washington U., Seattle. Coll. of Engineering.
THEORY OF UNEQUALLY SPACED ARRAYS,

by Shalhav Zohar. 2 Mar 62, 154p. incl. illus. 4 refs. (Research rept. no. PIBMRI-989-62)
(Contract AF 30(602)2213)
(RADC TDR 62-144) Unclassified report

DESCRIPTORS: *Transmission lines, *Coaxial cables, *Topology, *Electrical networks, Matrix algebra.

The subject of this work is a class of transmission line two-ports. More specifically the two-ports studied are constructed from lossless equal length coaxial lines whose shields are all connected to the common ground terminal. A two-port of this type having n internal junctions and further constrained not to contain a shorted line connected to any of these junctions is referred to as an n-th order strictly coaxial two-port. It is shown that the transition from such a network to its two-port admittance matrix can be represented as an orthogonal transformation effected by an n-th order orthogonal matrix U. This leads to realizability conditions which are formulated in terms of the poles and residues of the two-port admittance matrix and U. In the second phase of the work, two successive subdivisions of the strictly coaxial networks into smaller and more restricted classes are considered and the general results established are applied to them. The class defined by the second subdivision is found to be synthesizable. (Author)

AD-282 100 Div. 8, 2
(TISTP/JW) OTS price $1.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
IONOSPHERIC RESEARCH AND PROPAGATION STUDIES.
Quarterly progress rept. no. 8, 1 Apr-30 June 62, by H. D. Webb and R. A. Davidson. 30 June 62, 14p. incl. table.
(Contract DA 36-039-sc-85173, Proj. 3A99-20-001-04)
Unclassified report

DESCRIPTORS: *Ionosphere, *Antennas, Wind, Radio waves, Reflection, Moon, Wave transmission, Beams.

A calibration program was started for measuring the beamwidths and gains of the antenna at approximately 50 mc intervals from 300 to 1200 mc, using the sun as a radio source and methods described in previous reports. Cable losses are also being measured over this range of frequencies. It appears that the large log-periodic feed is usable above the design frequency of 500 mc, possibly up to 700 mc. Signals received by reflection from meteor bursts should be at the same frequency as the transmitted frequency except for a small Doppler frequency component due to ionospheric winds. Moon reflected signals were received on 47 days during the period for a total of approximately 470 hours. The heavy load on the computer and the shortage of personnel prevented processing the data into a form suitable for analysis and interpretation. The angle between the receiving and transmitting antenna feeds is larger and varies more than had been anticipated. Some methods proposed to resolve the ambiguity for moon reflections for transmissions at one frequency are shown to be fallacious. It is shown that at a given time data from two receiving stations may be used to resolve the ambiguity, provided that the ionosphere is the same above the two locations. (Author)

AD-282 110 Div. 8, 25
(TISTP/JW) OTS price $2.00

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
THE THEORY AND DESIGN OF F.M. RECEIVERS,
by Donald Hess. 11 May 62, 84p. incl. illus. (Research rept. no. PIBMRI-1026-62)
(Contract AF 18(600)1505)
(AFOSR-2654) Unclassified report

DESCRIPTORS: *Radio receivers, *Frequency modulation, Radio signals, Linear systems, Distortion, Errors, Modulation, Design, Wave characteristics.

The spectrum of an F.M. wave modulated by gaussian noise is studied. As the r.m.s. frequency deviation of the wave becomes greater than the maximum frequency component of the modulating signal, the power spectrum of the F.M. wave becomes gaussian in form independent of the power spectrum of the modulating signal. The response of linear band-pass networks to an F.M. signal is studied. The response of the linear network is written as the sum of a quasi static response and an error term. The quasi static response is a modified version of the steady state response. The modification permits a very tight bound to be put on the error term and hence leads to very tight bandwidth specifications on F.M. filters. Several new and several existing F.M.-demodulators are studied to establish design criteria for the demodulators. Finally the ability of a phase-lock loop to demodulate an F.M. signal is studied. Relationships are derived which specify the minimum closed loop bandwidth needed to demodulate a given F.M. signal with a specified amount of output distortion. (Author)

AD-282 112 Div. 8
(TISTW/RD) OTS price $8.60

Radio Corp. of America, Somerville, N. J.
DEVELOPMENT OF SILICON POWER TRANSISTORS.
Final rept., 10 June 60-30 June 62, by J. O'Brien, ed. by A. L. Leotti. 30 June 62, 87p. incl. illus. tables, 14 refs.
(Contract NObsr-81322)
Unclassified report

DESCRIPTORS: *Transistors, Manufacturing methods, Semiconductors, Diffusion, Vapors, Bonding, Silicon.

The NPIN structure was selected for the final fabrication of silicon power transistors. A discussion of the desired electrical parameters and their relationship to the physical structure of the device provides some of the necessary design criteria. Interdigitated or comb-type structures were evaluated to determine the optimum configuration for the current requirements. Photographs of the device are included to emphasize the product, as it is processed through each fabrication operation. Secondary breakdown of the device is discussed. Power dissipation measurements of final devices are included to show the device parameters obtained under normal circuit operation. (Author)

AD-282 129 Div. 8
(TISTP/WH) OTS price $5.60

Boeing Scientific Research Labs., Seattle.
THE PARALLEL PLATE PLASMA PROBLEM,
by Richard B. Hall. June 62, 49p. incl. illus. 3 refs. (Document no. D1-82-0173)
Unclassified report

Also available from the author.

DESCRIPTORS: *Plasma physics, *Circuits, *Impedance, *Magnetohydrodynamics, *Resonance, Fourier analysis.

The circuit-like behavior of a plasma situated between plane conducting boundaries is discussed.

AD-281 869 Div. 8
(TISTB/MS) OTS price $9.60

HRB-Singer, Inc., State College, Pa.
TRANSISTORS: A BIBLIOGRAPHY.
Mar 62, 113p. (Rept. no. S-61)
Unclassified report

DESCRIPTORS: *Bibliography, *Transistors.

The bibliography covers the period from 1959 to the present. It includes books, journals which consistently publish feature articles in the field of transistors, periodical articles, and documents which are a part of the resource of the Armed Services Technical Information Agency. Books, journals, and periodical articles are arranged alphabetically by subject and the references within each subject category are arranged alphabetically by title. Documents are arranged alphabetically by subject and references within each subject category are arranged alphabetically by the originating agency. Where possible, complete bibliographic information is provided for each reference. (Author)

AD-281 873 Div. 8
(TISTW/DLW) OTS price $17.00

ARINC Research Corp., Washington D. C.
HANDBOOK. RELIABILITY AND APPLICATION DATA FOR TRANSISTORS USED IN MISSILE ELECTRONIC SYSTEMS,
by W. H. von Alven and A. J. Dellinger.
1 Dec 61, 269p. incl. illus. tables (Pub. no. 145-11-271)
(Contract NOw 60-0331-c)
Unclassified report

DESCRIPTORS: *Transistors, *Handbooks, Guided missiles, Electronic circuits, Life expectancy, Electrical properties, Transistor amplifiers, Switching circuits, Silicon, Tests, Temperature, Specifications, Reliability.

A handbook is presented of reliability and application information on transistors used in military equipment. Typical variations of electrical parameters over a wide range of operating conditions are given for 14 selected transistor types. The information is presented in a form usable by production engineers for the improvement of reliability of transistorized equipment. Significant findings from sequential-environment life tests and recommended additions to pertinent military specifications are discussed. Typical characteristics and product variability are summarized at three discrete temperatures for the 14 transistor types. Also included are transistor behavior characteristics, as established through sequential-environment and multiple-level life tests; and reliablility diagrams based on data supplied by various manufacturers of transistors. (Author)

AD-281 889 Div. 8, 6
(TISTW/RD) OTS price $2.60

Electro-Mechanics Co., Austin, Tex.
MEASUREMENT TECHNIQUES FOR OBTAINING TRANSMITTER SPECTRAL OUTPUT.
26 Oct 61, 18p, incl. illus. table, 7 refs.
(Technical note no. 1)
(Contract AF 30(602)2519, Proj. 4540)
(RADC TDR 62-373) Unclassified report

DESCRIPTORS: *Radar transmitters, *Search radar, *Antenna radiation patterns, Radar stations, Measurement, Mobile, Radar equipment, Radar receivers, Spheres, Calibration, Display systems.

The present program of three-dimensional radiation measurements requires the services of an efficient crew which must travel to several locations throughout the southeastern United States. In preparation for making these required measurements, a preliminary measurement run was made on the AN/TPS-1D located at the EMCO Test Site, Dripping Springs, Texas. This report summarizes the three-dimensional radiation measurements made of the fundamental frequency of the AN/TPS-1D between 0 and 70 degrees elevation. Information is given concerning the equipment arrangements, shielding techniques and calibration techniques used. Photographs are used to show the equipment arrangements. The original radiation patterns taken for elevations between 0 and 70 degrees, at 5 degrees intervals of elevation, are given, as well as the completed three-dimensional plots. (Author)

AD-281 901 Div. 8, 25
(TISTP/JW) OTS price $14.50

General Electric Co., Schenectady, N. Y.
COLLECTION OF HEAT-TRANSFER PROPERTIES OF GASES AT MODERATE PRESSURES AND RULES FOR RAPID ESTIMATION OF MISSING DATA,
by F. J. Neugebauer. 30 Apr 62, 209p. incl. illus. tables, 19 refs. (Rept. no. 62GL54)
(Contract Nonr-380400)
Unclassified report

DESCRIPTORS: *Heat tranfer, *Gases, Thermal conductivity, Heat, Viscosity, Data processing systems, Pressure.

Plots of property data of 380 gases and of 84 elements and compounds considered as gases display correlations which allow convenient estimation of missing data. Constants needed for the estimation of properties of gas mixtures correlate in the same fashion. It appears to be possible to rapidly estimate specific heat, viscosity, and thermal conductivity of gases and constants needed for the prediction of mixture properties if only the empirical chemical formulas of the gases are known. The method allows a broad survey over the entire field of available gases. (Author)

AD-281 942 Div. 8
(TISTP/FR) OTS price $2.60

Naval Ordnance Lab., Corona, Calif.
TEST PROCEDURES IN EVALUATION OF TELEMETRY SUBCARRIER DISCRIMINATORS,
by K. L. Berns. 19 Apr 61, rev. Mar 62, 12p. incl. illus. (Technical memo. no. 73-65, supersedes Technical memo. no. 73-56, AD-260 023)
Unclassified report

DESCRIPTORS: *Discriminators, Telemeter systems, Tests.

A standard test schedule is outlined and methods of measurement are described for performance evaluation of telemetry subcarrier discriminators. A sample of the evaluation report format, designed for concise data presentation and rapid comparison of performance characteristics, is included as an appendix. The test schedule includes measurements to determine the following performance characteristics: (1) linearity, (2) instability, (3) frequency response, (4) effect of noisy subcarrier signals, (5) effect of subcarrier amplitude modulation, (6) effect of line voltage variation, (7) effect of load variations, (8) input filter selectivity, (9) output distortion, (10) output noise, and (11) packaging and operational characteristics. (Author)

AD-282 033 Div. 8, 15
(TISTP/WH) OTS price $12.50

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
STRICTLY COAXIAL TRANSMISSION LINE TWO-PORTS,

DESCRIPTORS: *Dipole antennas, *Dipole moments, Antenna radiation patterns, Transmission lines, Electromagnetic fields, Theory, Electromagnetic theory, Propagation, Electric fields, Mathematical analysis, Integral equations.

A study is presented of the radiation properties of a trailing wire antenna. The antenna is assumed to be a thin center-fed dipole antenna that is either straight making an angle with the vertical or curved in the shape of a catenary. First an expression is derived for the equivalent horizontal and vertical dipole moments of the trailing wire antenna from which the far fields can be computed by standard methods. The equivalent dipole moments are obtained because they are useful in mode theory. Second the far fields are calculated directly, no assumptions being made except those necessary to evaluate the integrals in closed form. The far field patterns obtained in this way are useful in ray tracing. For electrically short antennas both methods should lead to the same far field patterns. (Author)

AD-282 157 Div. 8
(TISTW/DLW) OTS price $14.00

New Mexico U. Engineering Experiment Station, Albuquerque.
LINEAR SIDE-LOADED TRANSMISSION-LINE ANTENNAS,
by Robert W. Kulterman. Aug 62, 194p. incl. illus. 9 refs. (Technical rept. no. EE-78)
(Contract Nonr-279801)
Unclassified report

DESCRIPTORS: *Airplane antennas, *Transmission lines, *Antennas Radiofrequency power, Impedance, Impedance matching, Airborne, Efficiency Theory, Electromagnetic theory, Mathematical analysis, Very low frequency, Low frequency, Mobile, Linear systems, Air towed Radio transmitters.

A need exists for a mobile transmitting antenna capable of radiating large amounts of power as efficiently as possible in the frequency range from 10 to 40 kc. Several mechanical and electrical problems are encountered in building and operating such an antenna. First, the antenna must be physically long to have any appreciable electrical length. Impedance matching is another problem in the operation of such an electrically short antenna. A side-loaded transmission-line antenna is proposed as a possible solution. This antenna has certain characteristics that make it very desirable as a physically long, electrically short, mobile antenna. (Author)

AD-282 158 Div. 8
(TISTW/RD) OTS price $1.60

National Magnet Lab., Mass. Inst. of Tech., Cambridge.
CURRENT CARRYING CAPACITY OF SUPERCONDUCTING Nb-Zr SOLENOIDS,
by D. Bruce Montgomery. July 62, 17p. incl. illus. table, 7 refs.
(Contract AF 19(604)7344)
(AFOSR-3015) Unclassified report

DESCRIPTORS: *Solenoids, Niobium alloys, Zirconium alloys, Superconductors, Superconductivity.

A mechanism of induced presistent currents is offered to explain the low current carrying capacity of Nb-Zr solenoids. The persistent currents are induced as the magnet is energized and are of sufficient magnitude to saturate the superconducting filaments. The magnitude of the induced currents can be estimated from a measurement of the residual field in the solenoid. The current carrying capacity of Nb-Zr solenoids is shown to be a particular function of field, inside diameter, and geometry. The most important conclusion drawn is that to generate fields in large bore magnets will require considerable more wire than would be predicted from considerations neglecting the induced currents. (Author)

AD-282 163 Div. 8, 25
(TISTP/WH) OTS price $3.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
CALCULATION OF DISTRIBUTED CONSTANTS OF MULTI-WIRE LINES,
by Akio Matsumoto. 10 May 62, 29p. incl. illus. tables, 7 refs. (Rept. no. PIBMRI-991-62)
(Contract AF 30(602)2213, Proj. 8505)
(RADC TDR 62-296) Unclassified report

DESCRIPTORS: *Transmission lines, *Electrostatic capacitance, *Inductance, *Wire, *Electrical networks, Matrix algebra, Shielding, Coaxial cables.

Synthesis with multiwire line is a new technique, which is useful, in higher frequencies, in meeting broader requirements. The characteristics of networks synthesized with multiwire lines can be determined by the distributed constants of the lines along with their lengths. Exact formulae for the distributed constants are known only for lines with simple constructions such as coaxial, balanced pairs and star quads. This analysis treats the method of calculating the distributed constants of a line consisting of three conductors, one is the shield and the other two are inner conductors. The method takes its origin from H. Kaden's, but a great deal of contrivances has been given to obtain fast convergence. A short table is given for the distributed capacitances and inductances of the line, in which one of the two inner conductors is coaxial with the shield and the other off-axial. This configuration can easily be transformed into other configurations with both inner conductors off-axial with the shield. Some approximate formulae are also given to allow a faster estimation of the distributed constants of the line. Comments are also made on slot-coupled lines and symmetrical two-wire lines. (Author)

AD-282 171 Div. 8, 25
(TISTP/JW) OTS price $6.60

Electromagnetics Lab., Stanford Research Inst., Menlo Park, Calif.
ANALYSIS OF RECTANGULAR-WAVEGUIDE RIGHT-ANGLE T-JUNCTION,
by Eugene Sharp. Jan 62, 62p. incl. illus. tables, 11 refs. (Technical note no. 1)
(Contract AF 30(602)2392)
(RADC TDR 62-182) Unclassified report

DESCRIPTORS: *Waveguides, *Electric currents, *Matrix algebra, Electromagnetic properties, Surfaces, Mathematical analysis.

An exact method is developed for analyzing the electrical performance of a rectangular waveguide T-junction in which the cross sectional dimensions of the side waveguide are different from the cross sectional dimensions of the through waveguide. The formulas derived for the equivalent admittance matrix of the T-junction are general in that they apply to any right-angle rectangular waveguide T-junction; the side arm of the T-junction may be placed in any position in either the broad or narrow wall of the through waveguide provided that all waveguide surfaces are either at right angles or parallel to each

It is desired to obtain analytical expressions for the complex impedance that the plasma capacitor presents to external measuring devices as a function of frequency. It is shown that the theoretical behavior of the plasma capacitor depends on the physical model of the plasma used, but that there are wide ranges of agreement between the hydrodynamic model and the kinetic equation point of view. (Author)

AD-282 131 Div. 8
(TISTW/RD) OTS price $3.60

Collins Radio Co., Cedar Rapids, Iowa.
EXPERIMENTAL X-BAND MASER RECEIVING COMPLEX.
Rept. for 1 May-31 July 62 on Phase 1.
31 July 62, 31p. incl. illus. tables (Rept. no. CRR-267)
(Contract AF 33(657)8604)
Unclassified report

DESCRIPTORS: *Radio receivers, *Masers, X band, Reflectors, Parabolic bodies, Preamplifiers, Microwave amplifiers, Power amplifiers, Microwave oscillators, Radio signals, Radio reception, Dipole antennas, Orbital flight paths, Antenna horns, Superhigh frequency.

An experimental X-band maser receiver complex is described; it requires the design and construction of a low noise receiving system for use in Project Leapfrog. This receiving system is for the reception of communications signals reflected from a belt of orbiting dipoles. The receiving system will consist of a 13.5 foot diameter parabolic reflector mounted on an SCR-584 radar pedestal. A Cassegrainian feed system will reflect the captured energy into a horn antenna near the vertex of the parabolic reflector. The horn antenna will be rotatable for changing polarization of the received signal. A twin cavity maser preamplifier will be used to amplify the received signal by approximately 20 db. The maser output then is passed through a dual frequency wave-guide filter to eliminate spurious responses and then is amplified further by a tunnel diode r-f amplifier. (Author)

AD-282 140 Div. 8, 25
(TISTE/MS) OTS price $2.60

General Telephone and Electronics Labs., Inc., Bayside, N. Y.
STUDIES OF ELECTRON TUBE MATERIALS AND THERMIONIC EMISSION PROCESSES.
Scientific rept. no. 9, 1 Apr-30 June 62, 30 June 62, 25p. incl. illus.
(Contract AF 19(604)7286, Proj. 4619)
(AFCRL 62-534) Unclassified report

DESCRIPTORS: *Thermionic emissions, *Oxide cathodes, Cathodes (Electron tubes), Electron tubes, Diodes, Materials, Nickel, Barium, Barium compounds, Oxides, Platinum, Molybdenum, Chemical reactions, Gases, Mass spectroscopy, Temperature, Ions, Molecular beams, Coatings, Sublimation, Evaporation, Thin films, Electron microscopy, Tests, Calibration.

The thermionic emission properties of ultra-pure nickel-base oxide cathodes in the clean test diode are being investigated. The sublimation from ultra-pure and N4 nickel-base barium oxide cathodes has been measured as a function of cathode temperature. The ion source was modified, resulting in an over-all sensitivity gain but slightly poorer resolution. The electron emission microscopy results previously observed for an ultra-pure nickel-base triple oxide cathode in a 21-inch diameter sealed-off emission microscope tube have been repeated under more or less identical experimental conditions in the demountable and constantly pumped tube in order to compare the operation of the cathode with that in a less favorable vacuum environment. The results are essentially the same. (Author)

AD-282 146 Div. 8, 25
(TISTP/WH) OTS price $10.50

Microwave Lab., Stanford U., Calif.
GENERATION OF SUB-MILLIMETER RADIATION BY A BUNCHED BEAM OF RELATIVISTIC ELECTRONS.
Technical rept.,
by Pedro A. Szente. July 62, 126p. incl. illus. 17 refs. (M.L. rept. no. 935)
(Contract Nonr-22548, Proj. NR 373-361)
Unclassified report

DESCRIPTORS: *Electron beams, *Relativity theory, *Microwaves, *Extremely high frequency, *Traveling wave electron accelerators, Theses.

The interaction of a bunched beam of relativistic electrons with several different microwave circuits was analyzed, with a view toward the generation of electromagnetic radiation in the submillimeter wavelength region. Because of relativistic effects, it was possible to use structures which had dimensions large compared to the desired wavelength. A relativistic electron beam was obtained from a traveling-wave linear accelerator which operated at a frequency of 9288 Mc/sec. The interaction properties predicted by theory were compared with the experimental results obtained from resonant cavities, from a dielectric-loaded slow-wave structure, and from two other special structures: a magnetic undulator and a sinuous waveguide. In the case of the magnetic undulator, approximately 150 milliwatts were generated at 5.4 millimeters, and 35 milliwatts at one millimeter. The shortest wavelength observed was 0.4 millimeter at a power level of 40 microwatts. (Author)

AD-282 147 Div. 8, 25
(TISTP/WH) OTS price $10.10

Michigan U., Ann Arbor.
AN AUTOMATIC SPEECH FORMANT TRACKING FILTER,
by George A. Hellwarth. May 62, 123p. incl. illus. (Rept. no. 10)
(Contract AF 49(638)492)
(AFOSR-2591) Unclassified report

DESCRIPTORS: *Speech transmission, *Acoustic filters, *Feedback, *Coding.

As a solution to formant frequency measurement in real time, a continuously tuned, automatic tracking filter system is proposed which locates these spectral maxima of speech signals through an application of automatic frequency control techniques. The experimental circuitry is described, stability and performance characteristics are given for this feedback control system and several figures are shown to demonstrate the ability of the system to track speech formants. The problem of constructing a complete speech analysis system utilizing tracking filters is discussed. (Author)

AD-282 155 Div. 8
(TISTW/DLW) OTS price $3.60

New Mexico U. Engineering Experiment Station, Albuquerque.
A STUDY OF THE ELECTRICAL DIPOLE MOMENT AND THE FAR FIELDS FROM A TRAILING WIRE ANTENNA,
by R. W. Kulterman. June 62, 27p. incl. illus.
(Technical rept. no. EE-74)
(Contract Nonr-279801)
Unclassified report

The design criterion is optimized gain bandwidth performance. Such performance is obtained by prescribing a flat power transfer characteristic, subject to the inherent restrictions of the load. The equalizer is then synthesized by the use of an approximation method devised by Carlin. Problems considered here are: (1) distributed parameter load; and (2) lumped parameter load associated with microwave broadbanding of a tunnel diode amplifier. (Author)

AD-282 248 Div. 8, 30
(TISTW/RD) OTS price $17.00

David Sarnoff Research Center, Princeton, N. J.
THEORY OF ADJUSTABLE SWITCHING NETWORKS. I: A. THRESHOLD LOGIC. B. RELIABILITY OF SWITCHING NETWORKS,
by S. Amarel, S. Levy, and R. O. Winder.
30 Apr 62, 261p. incl. illus. tables, refs.
(Special scientific rept. no. 1)
(Contract AF 19(604)8423, Proj. 4641)
(AFCRL 62-318) Unclassified report

DESCRIPTORS: *Switching circuits, Computer logic, Reliability, Mathematical analysis, Computers.

This report includes:
THEORETICAL CONSIDERATIONS ON RELIABILITY PROPERTIES OF RECURSIVE TRIANGULAR SWITCHING NETWORKS, by S. Amarel and J. A. Brzozowski. 52p. incl. illus. 10 refs.

THE RELIABILITY OF RECURSIVE TRIANGULAR SWITCHING NETWORKS BUILT OF RECTIFIER GATES, by Saul Levy. 54p. incl. illus. 3 refs.

A discussion is presented of a doubly infinite chain of properties of threshold functions, the second limit of which characterizes such functions. The first two properties, which are the most useful as necessary conditions, are given special attention; they yield interpretations in algebraic expressions for the function and provide a natural ordering of the function's arguments. Relations between the families of properties are given, and their independence shown. Some other conjectured characterizations of threshold functions are shown invalid. The number of threshold functions, as a function of n, is given a relatively good upper bound. (Author)

AD-282 249 Div. 8, 25, 26
(TISTM/AW) OTS price $4.60

Sylvania Electric Products, Inc., Woburn, Mass.
INVESTIGATION AND DEVELOPMENT IN THE AREA OF EPITAXIAL GROWTH TECHNIQUES.
Final rept., 1 June 61-1 June 62,
by P. Wang, V. Sils, and R. Berkstresser,
1 June 62, 42p. incl. illus. tables.
(Contract NObsr-85432)
Unclassified report

DESCRIPTORS: *Diodes, *Semiconductors, *Single crystals, Vapors, Phosphorus, Diffusion, Determination, Chemical impurities, Distribution, Argon, Oxides, Decomposition, Thickness, Electrical properties, Silicon, Lattices, Deposits, Control, Thin films, Measurement, Infrared spectroscopy, Design, Manufacturing methods, Growth.

Epitaxial growth techniques are investigated. A technique using phosphorus diffusion for determination of P-type epitaxial layer doping impurity profiles was developed. Detailed analyses of doping impurity transitions in both N and P type epitaxial layers were made. The contribution of various possible doping sources was investigated and means for reducing the system and substrate doping effect suggested. The use of phosphine doped argon for controlling resistivity of an N-type epitaxial layer has been successfully demonstrated. The technique of growing multi-epitaxial layer structures combined with effective oxide masking was demonstrated in the fabrication of PNPN four-layer switches with oxide masked overgrowth. (Author)

AD-282 270 Div. 8
(TISTM/MS) OTS price $11.50

Trionics Corp., Madison, Wis.
POLYCRYSTALLINE NEGATIVE RESISTANCE DEVICES.
Final engineering rept., 16 Dec 60-31 Dec 61.
31 Dec 61, 147p. incl. illus. tables.
(Contract NObsr-85160)
Unclassified report

DESCRIPTORS: *Negative resistance circuits, *Ceramic materials, Semiconductors, Single crystals, Test equipment, Test methods, Crystals, Chemical impurities, Silicon, Nickel compounds, Oxides, Ferrites, Processing.

Electrical characteristics and effects of variations in processing conditions were studied for negative resistance elements (Negistors) formed in polycrystalline ceramic matrices by a controlled electroprocessing technique. Most work was done with polycrystalline nickel ferrite, but single-crystal ferrite, oxide, and titanate matrices were also considered. The elements formed by electroprocessing consisted of a microscopic conductive path through the body of the matrix material. The principal mechanism responsible for the negative resistance characteristic of Negistors was found to be a thermal effect. Resistance heating of the electroprocessed path in the elements combined with a high negative temperature coefficient of resistance of the path above about 200 C results in the negative resistance. P-n junctions and both n+-n and thermal negative resistance elements were produced in silicon by an electrodoping process which is a modification of the electroprocessing technique used for forming Negistors. Unusual electrical switching characteristics were observed in nickel oxide elements. These elements switch between high- and low-resistivity states on application of suitable pulse voltages. (Author)

AD-282 272 Div. 8, 25
(TISTP/JW) OTS price $10.10

ARINC Research Corp., Washington, D. C.
THE ALLOCATION OF SYSTEM RELIABILITY. VOLUME II. STEP-BY-STEP RELIABILITY ALLOCATION PROCEDURE.
Final rept.,
by Harold S. Balaban, Hal R. Jeffers, and Donald O. Baechler. June 62, 138p. incl. illus. tables, 3 refs. (Pub. no. 152-2-274, vol. 2)
(Contract AF 33(616)7468, Proj. 4156)
(ASD TDR 62-20, vol. 2)
Unclassified report

DESCRIPTORS: *Electronic equipment, *Reliability, *Design, Feasibility studies, Electronic systems, Model tests, Failure (Mechanics), Specifications, Mathematical prediction.

A step-by-step procedure for implementing the allocation model described in Volume I of this report is presented with a discussion of methodology and required inputs. The basic data inputs, derived from an analysis of failure data representing over two-million equipment operating hours, and procedures for using them, are described. A procedure for determining the feasibility of the over-all system reliability requirement is presented. Detailed examples of the complete allocation procedure are also given. (Author)

other. This method requires the inversion of an infinite matrix; however, any desired accuracy can be obtained by considering a matrix of finite but sufficient size. Numerical calculations for two particular T-junctions showed that accuracies of about one-half percent can be achieved using matrices of reasonable size. The method can be applied to the analysis of other rectangular waveguide discontinuities or junctions for which no exact analysis is presently available. (Author)

AD-282 173 Div. 8
(TISTW/DLW) OTS price $2.60

Electrical Engineering Research Lab., U. of Texas, Austin.
EVALUATION OF EARTH PROBE ANTENNAS FOR VLF RECEPTION,
by Paul E. Martin, F. X. Bostick and others.
29 June 62, 24p. incl. illus. tables, 5 refs.
(Rept. no. 6-48)
(Contract AF 19(604)8513, Proj. 4610)
(AFCRL 62-517) Unclassified report

DESCRIPTORS: *Antennas, *Dipole antennas, *Radio reception, Very low frequency, Electrodes, Impedance, Tests, Underground structures, Signal-to-noise ratio.

An evaluation was made of an earth probe antenna formed by connecting receiver input terminals to electrodes in the ground 343 meters apart. Reception of coherence and sferic signals on this antenna at frequencies below 50 kc was compared with that received on horizontal overhead antennas. Although the voltage output from the overhead antennas was consistently higher than the signal taken from the ground probe antenna, the higher signal to noise ratio of the ground probe antenna indicated its potential use in the VLF range. (Author)

AD-282 191 Div. 8
(TISTE/CAM) OTS price $3.60

Diamond Ordnance Fuze Labs., Washington, D. C.
VARACTOR MICROWAVE FREQUENCY MULTIPLIERS,
by James C. McDade. 18 July 62, 38p. incl. illus. table, 12 refs. (DOFL rept. no. TR-1054)
(Proj. 16600) Unclassified report

DESCRIPTORS: *Frequency multipliers, *Diodes, *Electronic circuits, Microwave frequency, Nonlinear systems, Design, Impedance, Impedance matching, Electrostatic capacitance, Voltage, Frequency modulation, Radiofrequency oscillations, Resonance, Tuning circuits, Coupling circuits, Resistance.

The construction of varactor harmonic generators is often a time-consuming project because of certain problems that are characteristic of circuits employing reactive nonlinearity. This report describes some of the problems, giving methods to avoid them or render them harmless by simplified design procedures and laboratory techniques. The procedures and simplified design techniques described are considered feasible for eliminating and/or minimizing the problems that are inherently characteristic in circuits employing reactive nonlinearity. These procedures, are based on the simplified and experimental methods adapted for: (1) approximately calculating the diode impedance; (2) determining whether fundamental power is delivered to the varactor; and (3) directly determining the optimum bias voltage on the varactor for any tuning condition. (Author)

AD-282 245 Div. 8
(TISTE/CAM) OTS price $2.60

Nuclear Corp. of America, Denville, N. J.
PHOTOCOCAT, A PHOTOEMISSIVE COLD CATHODE.
Supplementary rept. on Cold Cathode Research and Development,
by Nathan Sclar. 1962, 15p. incl. illus.
(Contract NObsr-77591)
Unclassified report

DESCRIPTORS: *Phototubes, *Photoemission, *Cold cathode tubes, Electron tubes, Electron beams, Miniature electron tubes, Luminescence, Light, Surface properties, Sensitivity, Radioactive isotopes, Phosphors, Electric currents, Design, Processing, Electroplating, Metal films, Measurement.

The photococat approach was analyzed for the case where the cold light source is a miniature glow which activates a S-11 photoemissive surface. The calculations indicate an electron emission efficiency of the same order of magnitude as the oxide thermionic cathode with possibilities for even higher efficiencies if a regenerative light utilization is achieved. Emission levels up to the range of 10 milliamperes from a single miniature source are indicated. Five experimental photococats were synthesized and their emission properties measured. Electron emission at levels up to 10 microamperes were measured with steady emission after seasoning at the two microamperes level. These emission levels are believed due to non optimum photoemissive layers and to the Joulean heat generated in the photo surface which can be avoided by the use of low resistivity substrates. (Author)

AD-282 246 Div. 8
(TISTP/FR) OTS price $8.60

National Co., Inc., Malden, Mass.
CARBON MONOXIDE TIME STANDARD.
Final rept., 26 Apr 60-31 Dec 61.
Apr 62, 1v. incl. illus. refs.
(Contract AF 30(602)2249)
(RADC TDR 62-257) Unclassified report

DESCRIPTORS: *Time, *Frequency, *Standards, Extremely high frequency, Carbon compounds, Monoxides, Molecular beams.

It is desired to extend the precision and accuracy of molecular beam frequency standardization by increasing the transition frequency to the region of 100 kmc. The major objective is to increase the frequency stability of the molecular beam time standard by one order of magnitude. Emphasis was placed on the construction of an experimental molecular beam tube and detector-ionizer to detect the presence of a C12O16 molecular beam and on a study of the rotational states of carbon monoxide to determine parameters required for subsequent phases. A stabilized source of excitation radiation of frequency 115 kmc has been constructed and tested. Output power from this source should be sufficient to drive the molecular beam. (Author)

AD-282 247 Div. 8
(TISTP/WH) OTS price $4.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
DESIGN OF BROADBAND TRANSMISSION LINE EQUALIZERS,
by George I. Zysman. 5 June 62, 44p. incl. illus. 9 refs. (Research rept. no. PIBMRI-1018-62)
(Contract AF 30(602)2213)
(RADC TDR 62-234) Unclassified report

DESCRIPTORS: *Transmission lines, *Impedance, *Microwave networks, *Generators.

This analysis is concerned with the design of microwave broadband equalizers consisting of cascaded transmission lines, to work between a resistive generator and an arbitrary load.

AD-282 314 Div. 8, 26
(TISTM/ODN) OTS price $3.60

Motorola, Inc., Phoenix, Ariz.
SEMICONDUCTOR SURFACE PASSIVATION PRODUCTION REFINEMENT PROGRAM.
Quarterly rept. no. 4, 1 Jan-31 Mar 62,
by H. B. Bell and H. W. Cooper. 31 Mar 62,
32p. incl. illus. tables.
(Contract AF 33(600)42509, Proj. 7-879)
(AMC TR 7-879, vol. 4) Unclassified report

DESCRIPTORS: *Semiconductors, *Diodes, *Rectifiers, *Transistors, Glass, Lead, Low temperature research, Manufacturing methods, Silicon, Nitric acid, Tests, Fluorides, Oxides, Aging, Ammonium radicals, Diffusion, Gold, Silver, Alloys, Silicates, Evaporation, Surfaces, Surface properties, Plastics, Nickel, Molding, Electroplating, Acids, Platinum, Soldering, Stability, Reliability, Thin films.

Experiments and the resultant data on low temperature, lead glass passivation of the star transistor are reported. Production has instituted several changes in the processing of the star planar. Notable among these is the change from Al contacts and Ag wires to Au contacts and Au wires and changes in the base diffusion sheet resistivity. Recent major efforts on the low temperature passivation have revolved about the areas of pre-glassing cleanup, etching, solutions, and the developing of processing conditions necessary to evaluate the emitter diffused wafers after Pb glass passivation. The first experiment on the effects of etching time versus the electrical parameters showed significant differences in the values of h sub FE. The etchant used was 150 parts HNO3 to 1 part HF. (Author)

AD-282 316 Div. 8
(TISTW/DLW) OTS price $3.60

Micromega Corp., Venice, Calif.
C-BAND, WIDEBAND SOLID STATE AMPLIFIER.
Quarterly technical note no. 3, 15 Dec 61-15 Mar 62,
by Harvey M. Endler and Conrad E. Nelson.
15 Mar 62, 32p. incl. illus. 2 refs.
(Contract AF 30(602)2525, Proj. 5573)
(RADC TDR 62-318) Unclassified report

DESCRIPTORS: *Parametric amplifiers, *Noise (Radar), *Tuned amplifiers, Broadband, C band, Diodes, Microwave amplifiers, Electronic circuits, Tuning circuits, Design, Backward-wave oscillators, Solid state physics, Reduction.

A microwave circuit was developed for a fixed-tunnel, broadband amplifier that reduces the diode lead inductance and simultaneously resonates the diode at the center signal and the center idler frequency with a minimum reduction in available bandwidth. Parallel tuned coaxial resonators were developed to multitune the signal circuit. A wideband single-diode amplifier was constructed with a bandwidth of 900 mc. The absolute gain of the one-port amplifier and circulator varied between 9 and 12 db over the 900 mc. The noise figure of the paramp-circulator varied between 2.9 and 3.1 db over most of the frequency range. A tuned single-diode amplifier was developed which can be swept in single frequency over an 800 mc frequency range with nearly constant amplifier gain and noise figure. A 1300 mc tuning range is also possible with a deterioration in noise figure. (Author)

AD-282 326 Div. 8, 2
(TISTP/FR) OTS price $2.60

Oregon State U., Corvallis.
INVESTIGATION OF INSTRUMENTATION AND TECHNIQUES FOR ARMY WEATHER OBSERVATION.
Quarterly progress rept. no. 1, 1 Feb-30 Apr 62,
by Fred W. Decker, Kenneth H. Shreeve, and James W. Sears. 30 Apr 62, 22p. incl. illus. table, 6 refs.
(Contract DA 36-039-sc-89186, Proj. 3A99-27-005-07, Continuation of Contract DA 36-039-sc-78918)
Unclassified report

DESCRIPTORS: *Meteorological radar, *Radar pulses, Radar echo areas, Analysis.

Resumption of operations with Weather Radar Set AN/CPS-9 at McCulloch Peak, Oregon, in February 1962 required a number of maintenance, repair, and adjustment steps to produce reliable weather radar data. In order to utilize the equipment to the greatest advantage while securing certain replacement parts, the staff explored experimentally the possibility of deriving more meaningful data from the weather radar echo video signal by recording on an R-scope photograph the echoes from individual pulses. Several operating periods also provided PPI photographs for ultimate comparison with TIROS photographs and for detailed analytical comparison with the precipitation data collected in a dense network of nearby observing points. (Author)

AD-282 346 Div. 8
(TISTP/FR) OTS price $15.50

Electro-Optical Systems, Inc., Pasadena, Calif.
STUDY OF DATA TRANSMISSION SYSTEMS FOR A SPACE SIMULATION CHAMBER.
Final rept., 1 June-31 Dec 61,
by Duane D. Erway, Dean E. McDowell and Hans W. Metzger. Aug 62, 236p. incl. illus. tables, 22 refs. (Rept. no. AEDC-TDR-62-162)
(Contract AF 40(600)947, Proj. 7778)
Unclassified report

DESCRIPTORS: *Data transmission systems, *Space environmental conditions, Simulation, Test facilities, Multiplex transmission, Pulse modulation, Telemeter systems, Waveguides, Electrical cables, Klystrons, Recording systems, Vacuum systems, Electromagnetic waves, Materials, Electronic equipment.

Results are given of a study program of a telemetry system for a space environment simulation chamber. Suitable methods are determined for transferring data from 3000 test points on a rotating vehicle located inside a large environmental chamber to a data processing station outside the chamber. Various methods of data transmission, as well as related problems such as data coding and modulation and environmental effects, are analyzed. A PAM/FM microwave telemetry system utilizing waveguide rotary joints is recommended and a preliminary system design is offered. (Author)

AD-282 349 Div. 8, 25
(TISTW/EET) OTS price $1.10

Aeronautical Research Lab., Office of Aerospace Research, Wright-Patterson Air Force Base, Ohio.
THE POSSIBLE USE OF THE CLOSED CIRCUIT TELEVISION SYSTEM FOR OPTICAL RANGEFINDING.
Technical rept. on Research on the Quantum Nature of Light,
by Radames K. H. Gebel. July 62, 6p. incl. illus. 3 refs. (ARL-62-383)
Unclassified report

DESCRIPTORS: *Television display systems, *Optical equipment, *Range finding, Transducers, Light, Mirrors, Image converter tubes, Optical images, Brightness, Illumination, Sensitivity, Detection, Television equipment, Light transmission, Optical systems, Mathematical analysis, Image intensifiers, (Electronics).

# Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-282 275 Div. 8
(TISTP/JW) OTS price $4.00

Lockheed Aircraft Corp., Sunnyvale, Calif.
INVESTIGATION OF THRESHOLD SWITCHING TECHNIQUES FOR DIGITAL COMPUTERS.
Final rept., 20 Mar 61-31 Jan 62.
June 62, 274p. incl. illus. tables, 26 refs.
(LMSC rept. no. 2-01-62-1)
(Contract AF 33(616)8035, Proj. 7062)
(ASD TDR 62-308) Unclassified report

DESCRIPTORS: *Linear systems, *Electronic switches, *Electrical networks, Signal-to-noise ratio, Digital computers, Complex variables, Design, Functions, Mathematical analysis, Switching circuits.

Major emphasis is placed on theoretical aspects of threshold functions with particular attention given to synthesis methods for specifying networks of threshold devices. Techniques are presented for determining linear separability and for calculating weights and threshold for those functions which are linearly separable. Algorithms for partitioning switching functions into sets of threshold functions are described as well as techniques for decomposing networks of unconstrained threshold devices into networks of devices satisfying certain design constraints. Special consideration is given the effects of noise and tolerances in several types of circuits suitable for threshold devices with the primary objective of determining the important design constraints. Logical design examples are presented to demonstrate the general utility of threshold functions. (Author)

AD-282 283 Div. 8, 7
(TISTM/AW) OTS price $1.00

Aerospace Corp., Los Angeles, Calif.
EQUIVALENT CIRCUITS AND EFFICIENCIES OF FUEL CELLS,
by J. I. Slaughter. 17 May 62, 31p. incl. illus. tables, 9 refs. (Rept. no. TDR-930(2240-55)TN-1)
(Contract AF 04(647)930)
(DCAS TDR 62-106) Unclassified report

DESCRIPTORS: *Fuel cells, *Circuits, Heat of reaction, Thermodynamics, Electrical properties, Hydrogen, Oxygen, Polarization, Chemical reactions, Entropy, Theory, Effectiveness.

A thermodynamic equivalent circuit which yields the correct current-potential curve for low current is determined for a fuel cell. A linear electrical equivalent circuit is constructed which represents closely the electrical performance of the cell over a wide range of current (not approaching zero). Polarization processes are taken into account through a single constant parameter. Introduction of the equivalent thermal potential into the circuit yields a thermodynamic equivalent circuit whose output coincides exactly with that given by the electrical equivalent circuit. The correct electrical properties, thermodynamic power balance, and thermodynamic efficiency follow directly from the circuit. A general theorem is formulated, independently of the validity of an equivalent circuit, connecting the thermodynamic and electrical efficiencies of a fuel cell. Confirmatory experimental results based on hydrogen-oxygen cells are presented. The experimental results underline the large reduction in available power brought about by polarization processes in a fuel cell, in addition to that produced by the entropy change in the chemical reaction. (Author)

AD-282 292 Div. 8, 30
(TISTP/WH) OTS price $2.60

Cruft Lab., Harvard U., Cambridge, Mass.
A METHOD OF MEASURING THE TIME-DEPENDENT IMPEDANCE OF THE LOAD,
by Keigo Iizuka. 20 Apr 62, 10p. incl. illus. table, 6 refs. (Technical rept. no. 364)
(Contract Nonr-186632, Proj. NR 371-016)
Unclassified report

DESCRIPTORS: *Microwave probes, *Impedance, *Coaxial cables, Plasma physics, Photoelectric cells.

By processing a sequence of scope pictures of the output from the probe of a standing-wave detector placed successively at a sequence of positions along a slotted coaxial line, the instantaneous values of a non-stationary load impedance terminating a coaxial line may be measured. This method was applied to measure the instantaneous values of the impedance of a fast-response Cadmium Selenide photo-cell which has a rise and decay time of the order of milliseconds. The experiments were performed at 600 mc. The experimental results were satisfactory and a change that took place in a few milliseconds could easily be measured. On the other hand, a change that occurs in a few tenths of a microsecond would be near the present limit of measurement. This technique could be extended to the measurement of the dynamic impedance of a plasma tube during the rise and decay period of the plasma intensity, or to the measurement of dynamic conductivities, or electric and magnetic susceptibilities in general. (Author)

AD-282 306 Div. 8, 26
(TISTM/EJH) OTS price $5.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
AGING CHARACTERISTICS OF QUARTZ CRYSTAL RESONATORS.
Quarterly rept. no. 5, 15 Feb-15 May 62,
by R. B. Belser and W. H. Hicklin. 15 May 62, 46p. incl. illus. tables.
(Contract DA 36-039-sc-87407)
Unclassified report

DESCRIPTORS: *Quartz resonators, *Quartz crystals, Crystals, Aging, Frequency stabilizers, Crystal ovens, Temperature, Control, Design, Frequency, Measurement, Seals, Bonding, Radiation effects, Gamma rays, Stability, Storage, Silver plating, Gold plating, Plating, Aluminum.

The measurement accuracy and resonator stabilities obtained have directed attention to oven temperature control and oven design as the principal remaining areas wherein improvements must be made for attainment of maximum resonator stabilities. Problems encountered are associated with large ovens where heat losses, entry recovery, and frequency versus position differences cause significant variations in frequency measurements for a given resonator. Measurement of Q for resonators fabricated, made for the series mode of operation, has given values in the range 100,000 to 300,000. Resonators previously fabricated have continued to exhibit excellent stabilities within the limitations of the measurement and temperature control facilities. Mounting of resonators in the HC-27/U glass container is now giving excellent yield (about 90%). Ag plated units did not survive heat requirements for sealing.

alloys, Ceramic materials, Welding, Brazing, Radiofrequency oscillators, Radiofrequency amplifiers, Platinum, Titanium, Capacitors, Feedback, Bonding, Electroplating, Circuits.

TIMM tube research and development efforts were continued in the areas of electrical and mechanical design, materials evaluation, component fabrication and evaluation, module fabrication and radiation effects studies and evaluation. Triode grid investigation programs were continued with emphasis being placed on improvement of previously used tensioning techniques and the evaluation of new techniques and means to stretch the mesh and to control grid flatness in the finished device. An optical grid transparency measuring instrument has been designed and is currently being used for 100 per cent sorting of grids. Programs are continuing to design a hexagonal mesh grid, equivalent to the 0.004 x 0.040 rectangular mesh, for improved mechanical strength. A TIMM pentode is being developed for improved electrical performance. Design parameters are discussed and desired electrical characteristics and cross section views of the device are presented. (Author)

AD-282 412 Div. 8
(TISTE/CRJ) OTS price $2.60

Electro-Optical Systems, Inc., Pasadena, Calif.
TUNNEL EMISSION AMPLIFIER INVESTIGATION.
Interim engineering rept. no. 3, 1 Apr-30 June 62,
by L. E. Godycki. 30 July 62, 18p. incl. illus.
(EOS rept. no. 2060-Q-3)
(Contract AF 33(657)7631)
Unclassified report

DESCRIPTORS: *Triodes, *Diodes, *Microwave amplifiers, Tantalum, Tantalum compounds, Oxides, Silicon, Copper, Aluminum, Gold, Thin films, Materials, Thermionic emission, Field emission, Direct current, Measurement.

Investigations were continued on the tunnel emission amplifier. The difficult tantalum materials problem was solved; a new supply of extra high purity tantalum allows the preparation of devices which are extremely stable electrically. With this new material, various diode and triode structures were prepared from a combination of tantalum, tantalum oxide, silicon and the metals copper, aluminum and gold. These materials, in a new device geometry, provided structures which were stable electrically toward the flow of current between emitter and collector. Difficulties were encountered, however, in contacting to the base layer of the new geometry and, for that reason, attempts to control the flow of current through the base layer were not very successful. Various diode structures, tantalum, tantalum oxide, and gold or aluminum were prepared for dc measurements. In particular, current time curves at constant bias yielded results which correlate very well with space-charge-limited current flow through insulators. In conjunction with the dc measurements, some calculations were made to determine the range of validity of the relationships for both Schottky emission and tunnel emission in the tantalum oxide structures. (Author)

AD-282 442 Div. 8, 23
(TISTE/CAM) OTS price $6.60

Army Ordnance Missile Command, Redstone Arsenal, Huntsville, Ala.
DEVELOPMENT OF NEW RADIO-FREQUENCY ATTENUATION DEVICES,
by Daniel G. Tailleur and R. L. Langston.
26 July 62, 56p. incl. illus. 3 refs. (Rept. no. RT-TM-62-16)
Unclassified report

DESCRIPTORS: *Radiofrequency attenuators, *Electromagnetic shielding, Electromagnetic waves, Radiation hazards, Guided missile personnel, Watertight doors, Radiofrequency power, Test equipment, Test methods, Maintenance, Attenuation, Shielding.

The results are presented from radio-frequency attenuation tests of six shielding devices installed on a personnel door of a radio-frequency shielded room. The shipboard-type, watertight hatch, personnel door was modified for use in these tests by installing a channel around the door periphery and a channel around the door frame for insertion of the RF barrier device. Of the six RF barrier devices tested, a copper mesh material provided the highest RF attenuation. (Author)

AD-282 490 Div. 8, 26
(TISTE/CDM) OTS price $12.50

RCA Defense Electronic Products, Camden, N. J.
FABRICATION PROCESSES FOR MICRO-MODULES, PART I.
Formal engineering rept. on Micro-Module Production Program.
30 June 62, 171p. incl. illus. tables.
(Contract DA 36-039-sc-75968)
Unclassified report

DESCRIPTORS: *Microminiaturization (Electronics), *Manufacturing methods, *Electronic equipment, Cleaning, Encapsulation, Electric connectors, Coatings, Silicones, Thin films, Production, Design, Test methods, Specifications, Test equipment, Electronic circuits, History, Processing.

A comprehensive history and complete description are presented of the recommended micro-module assembly processes as they were developed. The process information was prepared primarily for use by present and future micro-module manufacturers. Detailed operating instructions for producing high reliability micro-modules are given. The evolution of each process, including a description of the attendant problems and their solutions, is covered. The module assembly process is described in detail. Each step in the process is discussed and the associated operating instructions and requirements are delineated. Working drawings for the construction of jigs, fixtures, tooling and test equipment are included. (Author)

AD-282 508 Div. 8, 26
(TISTW/DLW) OTS price $4.60

Western Electric Co., Laureldale, Pa.
PRODUCTION ENGINEERING MEASURE. DIFFUSED SEMICONDUCTOR DEVICES 7, 12 PLUS 2N559 AND 2N1094.
Quarterly progress rept. no. 19, 10 Mar-10 June 62,
by M. N. Reppert. 10 June 62, 38p. incl. illus. table.
(Contract DA 36-039-sc-72729)
Unclassified report

DESCRIPTORS: *Transistors, *Manufacturing methods, *Guided missiles (Surface to air), Machines, Processing, Design, Tools, Test equipment, Production, Semiconductors, Electronic equipment.

Two machines, header glassing and platform lead welding no. 1, were completed. Engineering effort also continued on eleven incomplete machines. Progress made on 2N559-2N1094 mechanization is summarized and machine status is determined by the status of its most incomplete component. (Author)

A new transducer capable of automatic background compensation is suggested for use in an electronic comparator system employed as a passive optical rangefinding technique. The transducer, which is a vacuum tube similar to the image orthicon, achieves the background compensation by neutralization of opposite charge patterns on a special target plate structure. Some of the theoretical capabilities and sensitivities of such a system are analyzed. (Author)

AD-282 359 Div. 8
(TISTW/PCR) OTS price $4.60

Amphenol-Borg Electronics Corp., Chicago, Ill.
DEVELOPMENT AND PRODUCTION REFINEMENT OF MIL-C-26518(USAF) CONNECTORS, ELECTRICAL, MINIATURE RACK AND PANEL ENVIRONMENTAL RESISTING, 200 C AMBIENT TEMPERATURE.
Applications engineering rept. Mar 59-May 62, by Carl H. Stuart. May 62, 34p. incl. illus. table.
(Contract AF 33(600)35971)
(ASD TR 62-7-625A) Unclassified report

DESCRIPTORS: *Electric connectors, *Panel boards (Electricity), Reliability, Maintenance, Manufacturing methods, Crimping tools.

A new family of connectors was developed, and improved production refinement techniques established for their manufacture. A significant upgrading in connector reliability, operational performance, and serviceability was achieved. Physical, electrical, and mechanical performance data, as well as servicing procedures, are given. (Author)

AD-282 365 Div. 8
(TISTP/FR) OTS price $3.60

Digital Computer Lab., U. of Illinois, Urbana.
FAILSAFE CIRCUITS,
by John Hill. 22 June 62, 34p. incl. illus. table (Rept. no. 120)
(Contract Nonr-183415)
Unclassified report

DESCRIPTORS: *Electronic circuits, Digital computers, Failure (Mechanics), Reliability, Life expectancy, Computer logic, Radiofrequency oscillators, Radiofrequency amplifiers, Delay lines, Pulse counters, Cathode followers, Timing circuits.

The concept of failsafe circuits stems from the wish to have circuits with a higher reliability than the individual component reliabilities will allow. Failsafe circuits extend over-all circuit reliability by allowing certain component failures inside the circuit. In the circuits considered, the physical components are resistors, capacitors, inductors, connecting wires and transistors. However, in the circuit construction and in the mathematical analysis, the primary concern is with single transistor failures. This assumption that only transistors fail is based on the idea that resistors, capacitors and connections of arbitrarily good reliability can be procured, but that there is usually a particular reliability limit in the high-speed transistors. It will be seen that the failsafe circuits can withstand any single resistor, capacitor, or transistor failure, and that the failure indicator will signal any resistor or transistor which has ceased to operate. (Author)

AD-282 367 Div. 8
(TISTW/PCR) OTS price $9.60

Linfield Research Inst., McMinnville, Oreg.
STUDY OF FIELD EMISSION FROM SEMICONDUCTORS; FIELD EMISSION APPLICATIONS; ELECTRON GUNS FOR FIELD EMISSION BEAMS.
Final technical rept., 1 May 57-31 Dec 60, by F. M. Charbonnier, R. L. Perry, and C. H. Hinrichs. 31 Dec 60, 58p. illus. 46 refs.
(Contract NObsr-72697, Proj. NE 110-000)
Unclassified report

DESCRIPTORS: *Field emission, *Semiconductors, Germanium, Silicon, Electron microscopy, Microwave equipment, Electron optics, Microwave frequencies, Cavity resonators, Electrostatics, Electron guns, Cold cathode tubes, Electron beams, Focusing.

The study of field emission from semiconductor materials is reported in some detail. Items covered include: Fabrication of field emission tips, operation of tips in a field emission projection microscope, interpretation of field emission patterns, migration processes, doping of tip material, tip geometry, tip temperature, and operation in a boron-free environment. Field emission applications are reported. A study of the electrostatic focusing of high current density field emission beam is described.

AD-282 388 Div. 8, 6, 1
(TISTE/CRJ) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DIVISION 7. ENGINEERING.
Quarterly progress rept., 15 Jan-15 July 62. 15 July 62, 16p.
(Contract AF 19(628)500)
(AFESD TDR 62-113) Unclassified report

DESCRIPTORS: *Radar antennas, *Parabolic antennas, *Search radar, Transport planes, Reflectors, Release mechanisms, Instrumentation, Optical equipment, Radar equipment, Camera tubes, Electron optics, Control systems, L band, Moon, Tracking telescopes, Television cameras, Waveguides, Cooling.

All parts of the Haystack antenna system, with the exception of the reflector panels, were fabricated. The 120-foot reflector is being assembled in a face-up position on simulated elevation axis bearings. The Millstone Hill 84-foot parabolic reflector was preassembled and tolerances were checked. X-band dipole dispensers weighing 350 pounds and carrying 110 pounds of dipoles are being designed. A package is 44 inches in diameter, 6 inches long, with a 0.7-inch thick shell containing 180 blocks of dipoles. The mechanism will be ejected from a rocket with a rifle mechanism at an axial speed of one foot per second and a peripheral speed of 10 fps. Stabilized airborne platforms and servo linkages to ground-based radars are being designed. The location of the optical equipment on the KC-135 aircraft was determined on layout drawings. (Author)

AD-282 398 Div. 8
(TISTW/PCR) OTS price $11.50

General Electric Co., Owensboro, Ky.
RESEARCH AND INVESTIGATION ON RADIATION RESISTANT, HIGH TEMPERATURE THERMIONIC CIRCUITRY.
Interim engineering rept. no. 5, 1 Apr-30 June 62,
by Fred J. Schmidt. 30 June 62, 146p. incl. illus. tables, 6 refs.
(Contract AF 33(616)8096)
Unclassified report

DESCRIPTORS: *Thermionic emission, *Electronic circuits, Miniature electron tubes, Miniature electronic equipment, Radiation effects, Triodes, Pentodes, Resistors, Nickel

AD-282 628 Div. 8
(TISTW/DLW) OTS price $5.60

Airtron, Inc., Morris Plains, N. J.
DEVELOPMENT OF A FERRITE MATERIAL FOR A HIGH POWER PHASE SHIFTER AT S-BAND.
Interim development rept., 18 Apr-18 July 62. 20 Aug 62, 47p. incl. illus. tables, 11 refs.
(Contract NObsr-87388)
Unclassified report

DESCRIPTORS: *Phase shifters, *Ferromagnetic materials, *Ferrites, Microwave equipment, Radiofrequency power, Nickel compounds, Preparation, Processing, Test methods, Design, S band, Manufacturing methods.

The development of a ferrite material suitable for operation at 250 Kw peak power in a phase shifter device operating at S-band frequencies is discussed. This work is centered around the nickel aluminum gallium ferrite system. Several compositions were prepared and fired and an evaluation was started. A preparation procedure was developed and a variation of this procedure will be used for the composition selected for device use. The hot press and flame spray apparatus was designed. All the required measuring setups were assembled except the loss vs. peak power apparatus. The static properties of the ferrites, saturation magnetization as a function of temperature, Curie temperature, density, dielectric constant and dielectric loss were measured and are discussed. (Author)

AD-282 652 Div. 8, 6
(TISTE/CRJ) OTS price $3.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
RESEARCH ON ELECTRONIC RECONNAISSANCE ANTENNAS.
Interim engineering rept., 21 Feb-30 May 62. 1 June 62, 27p. incl. illus. 4 refs. (Rept. no. 903-27)
(Contract AF 33(616)6211, Proj. 6278)
Unclassified report

DESCRIPTORS: *Dipole antennas, *Slot antennas, *Radar antennas, *Parametric amplifiers, *Radar echo areas, Radar equipment, Communication equipment, Radar ranges, Broadband, Impedance matching, Electronic circuits, Diodes, Impedance, Antenna radiation patterns, Measurement, Countermeasures, Ultra high frequency, Very high frequency, Control.

A voltage-tunable hybrid-coupled parametric amplifier, completely stable regardless of input termination, was tested at 220 mc with a 2.6 db noise figure and 9 db gain, and with gain of up to 30 db but with sacrifice in noise figure. Admittance expressions were derived for four different types of modified folded dipole antennafiers. A satisfactory far-field criterion for supergain antennas was devised based upon the far-field criterion of an equivalent conventional array. Curves are presented showing the inadequacy of the usual far-field criterion when applied to a supergain array. A pair of orthogonal compensated T-bar slot antennas is discussed as a possibility for an integrated design with the hybrid-coupled parametric amplifier to form an experimental active echo-area control device. Passive echo-area control was demonstrated by substantial cancellation of the echo from a small flat plate by the echo from a small open-circuited slot antenna cut into the plate. A UHF radar measurement facility for 422 mc is near completion. (Author)

AD-282 653 Div. 8
(TISTE/CAM) OTS price $12.00

Antenna Lab., Ohio State U. Research Foundation, Columbus.
NOVEL TECHNIQUES IN THE ANALYSIS AND DESIGN OF MICROWAVE FILTERS AND RADOMES.
Rept. on Research on Integrated Radome-Scanner Design Techniques,
by Harvel N. Dawirs. 18 July 62, 162p. incl. illus. 6 refs. (Rept. no. 1382-4)
(Contract AF 33(657)7622)
Unclassified report

DESCRIPTORS: *Radomes, *Transmission lines, *Microwave networks, *Radiofrequency filters, *Microwave equipment, Design, Impedance, Attenuation, Propagation, Reflection, Analysis, Mathematical analysis, Measurement.

The techniques commonly employed in making microwave impedance calculations are extended and generalized so that they greatly facilitate the calculations involved in the analysis of transmission line networks. The combined techniques for calculating input impedances and for determining the attenuation characteristics directly from a plot of these impedances on a Smith Chart, or on the special filter analysis chart, provides a new method of analyzing filters that is particularly well adapted for use with transmission line networks. These techniques are applied to the analysis of the special class of transmission line filters which consists of a number of stubs uniformly spaced along a transmission line. An example of the analysis of a low-pass filter of the varying impedance type is also shown. It is shown that the technique presented may be very useful in the analysis of multilayered radome walls. The principles presented not only make the direct design of microwave filters practical but contribute to the knowledge of the characteristics and behavior of filters in general. (Author)

AD-282 663 Div. 8, 30, 6
(TISTP/TL) OTS price $1.10

Columbia U., School of Engineering, New York.
ANALYSIS AND SYNTHESIS OF NONLINEAR FILTERS AND PREDICTORS.
Final rept.,
by Ralph J. Schwarz. 1 May 62, 6p. 13 refs.
(Rept. no. CU-16-62-AF-4140-EE)
(Contract AF 19(604)4140, Proj. 5632)
(AFCRL 62-366) Unclassified report

DESCRIPTORS: *Nonlinear systems, *Radiofrequency filters, *Detection, *Signals, Noise, Integral equations, Mathematical prediction, Time, Series, Statistical processes, Statistical functions, Signal-to-noise ratio, Analysis, Synthesis, Analog-to-digital converters.

Contents:
Nonparametric methods for the detection of signals in noise
Nonlinear filters with quantized inputs
Optimum filters for specified inputs
Optimal message processes
Correlation functions of class N1 systems
Optimum filters with quantized outputs
Optimum zero memory filters
Quantizers for continuous noisy signals
Optimum analog to digital converters
Minimax analog to digital converters

AD-282 696 Div. 8
(TISTW/RD) OTS price $1.60

Electron Physics Lab., U. of Michigan, Ann Arbor.
RESEARCH AND DEVELOPMENT ON HIGH-POWER CRESTA-

AD-282 529 Div. 8, 26
(TISTE/CAM) OTS price $2.60

General Electric Co., Syracuse, N. Y.
PRODUCTION ENGINEERING MEASURE ON HIGH PERVEANCE CATHODE RAY TUBES.
Quarterly progress rept. no. 4, 8 Mar-7 June 62, by Edward T. Rate. 7 June 62, 26p. incl. illus. tables.
(Contract DA 36-039-sc-85965)
Unclassified report

DESCRIPTORS: *Cathode ray tubes, *Manufacturing methods, Design, Electron guns, Modulation, Voltage, Electrodes, Electromagnetic lenses, Focusing, Secondary emission, Tests, Production.

Research and production was continued on high-perveance cathode ray tubes. Experiments to reduce the large beam angle and its resulting effects were attempted but were not completely successful. The Z4808 FRM tube was constructed, and no additional problem areas were encountered in this larger configuration. A facility was set up to provide dot cathodes and drill 0.003-inch diameter meniscus apertures on a production basis. (Author)

AD-282 540 Div. 8, 25
(TISTP/WH) OTS price $4.60

Martin-Marietta Corp., Baltimore, Md.
OPTIMUM APERTURE STUDY,
by H. B. McClung. Aug 62, 41p. incl. illus. table (Rept. no. RM 225)
(Contract AF 30(602)2676, Proj. 4506)
(RADC TDR 62-334) Unclassified report

DESCRIPTORS: *Antennas, *Antenna radiation patterns, Integral transforms, Integral equations.

The objective of this analysis is to study the applicability of the Wiener-Spencer theorem to antennas. This theorem states that minimum standard deviation of the far-field power pattern occurs when the illumination function corresponds to the lowest mode of vibration of a membrane stretched across the aperture opening. The analysis concerns the first phase of this study in which various representative distributions and far-field power patterns for a linear and a square antenna are considered. A comparison of these distributions and the optimum distribution as determined by the Wiener-Spencer theorem is made. In addition, a survey is made of the known geometrical configurations in which Helmholtz's equation is separable. (Author)

AD-282 620 Div. 8
(TISTE/CRJ) OTS price $2.60

University of Southern Calif. Engineering Center, Los Angeles.
ON THE DIELECTRIC COATED PROLATE SPHEROIDAL ANTENNA,
by Cavour W. H. Yeh. June 62, 19p. 5 refs.
(USCEC rept. no. 82-204)
(Contract AF 19(604)6195, Proj. 4642)
(AFCRL 62-398) Unclassified report

DESCRIPTORS: *Antennas, Ellipsoids, Dielectrics, Coatings, Linear systems, Plasma physics, Electric fields, Magnetic fields, Differential equations, Series, Functions.

Using the orthogonality relations of spheroidal functions, the exact solution for the problem of an unsymmetrically fed dielectric coated prolate spheroid is obtained. It is shown that due to the presence of the dielectric coating each expansion coefficient for the radiated field is coupled with all expansion coefficients for the applied field. Consequently, the mode concept for an uncoated prolate spheroid as introduced by Chu and Stratton and as elaborated by Schelkunoff, must be modified, and the definition for the modes of oscillation must be more specific. It is also demonstrated that all field expressions reduce to those for a coated spherical antenna as the spheroid degenerates to a sphere. (Author)

AD-282 621 Div. 8, 26
(TISTW/DLW) OTS price $4.60

Sturtevant Div., Westinghouse Electric Corp., Boston, Mass.
THEORETICAL AND EXPERIMENTAL RESEARCH TO ASSIST IN PREPARATION AND DESIGN OF A HIGH FREQUENCY SILICON CARBIDE ACTIVE DEVICE,
by H. C. Chang. Apr 62, 44p. incl. illus. tables, 5 refs. (Scientific rept. no. 3)
(Contract AF 19(604)8499, Proj. 4608)
(AFCRL 62-335) Unclassified report

DESCRIPTORS: *Transistors, *Semiconductors, *Manufacturing methods, Silicon, Silicon compounds, Carbides, High frequency, Diffusion, Growth, Evaporation, Alloys, Crystal structure, Processing, Preparation.

Investigations were continued of adapting to silicon carbide the techniques used for the fabrication of silicon transistors. The techniques under investigation are epitaxial growth, diffusion, etching, and evaporated alloyed contacts. Results of epitaxial growth experiments were improved by modifications in the apparatus and by varying the experimental conditions, in particular the substrate temperature and the growth rate. A two-step aluminum diffusion process was initiated to improve the control of the diffused junction properties. Gold-tantalum and gold-tantalum-aluminum were evaporated on and alloyed with good wetting into silicon carbide. Precise configuration of the alloyed contacts of the unipolar transistor can be achieved by molten sult etching and musking techniques. A number of musking materials were examined, and the most promising was zirconium. (Author)

AD-282 624 Div. 8
(TISTE/CAM) OTS price $2.60

Watkins-Johnson Co., Palo Alto, Calif.
DEVELOPMENT OF S-BAND LOW-NOISE PERIODIC PERMANENT MAGNET TRAVELING-WAVE TUBE,
by B. P. Israelsen and J. H. Foster. 20 June 62, 15p. incl. illus. 2 refs. (Rept. no. W-J 62-604R1)
(Contract AF 30(602)2694, Proj. 4506)
(RADC TDR 62-327) Unclassified report

DESCRIPTORS: *Traveling wave tubes, *Microwave amplifiers, Magnets, S-band, Noise (Radio), Electron guns, Design, Focusing, Anodes, Helixes, Magnetic fields, Measurement, Electron beams.

The principal problem areas in the development of an S-band, low-noise, periodic, permanent magnet traveling-wave tube are discussed. Lens effects in the gun region are reduced by the use of larger anode apertures, contributing to improved operation in the 600-gauss field of a permanent magnet. A pin-seal input match was tested which might make possible a considerable reduction in total beam length. Magnets were designed for use in a reversed-field structure. A magnetic circuit for producing a PM-PPM field is described, and test results are cited. (Author)

DESCRIPTORS: *Microminiaturization (Electronics), *Dielectric films, *Semiconducting films, *Molectronics, *Electronic circuits, Preparation, Pyrolysis, Vapor plating, Vacuum apparatus, Germanium, Silicon, Electrical properties, Dielectric properties, Stability, Thickness, Refractory materials, Intermetallic compounds, Single crystals, Crystals, Growth, Electric fields, Crystal structure, Electronic circuits, Thin films.

This report includes:
Fullam, Ernest F., Inc., Schenectady, N. Y.
ELECTRON DIFFRACTION ANALYSIS OF EVAPORATED FILMS. 9 July 62.

Research continued on thin-film circuits and systems in which electronic circuit elements are integrated in a material matrix to a point where individual elemental appearances have been lost. The circuits will be capable of operating at 500 C., and should possess a high degree of radiation resistance. The circuits, as conceived, will contain microareas within a single film and/or be formed of layers of metals, semiconductors, and dielectrics in preconceived conceived configurations to provide the necessary electronic functions. The objective is to be accomplished by performing studies of film and microcrystal formation, surface and interfacial phenomena, and geometric studies of configurations to use, to the maximum advantage, the physical effects that occur in thin films. The electronic circuits so formed will possess a maximum degree of microminiaturization. (Author)

AD-282 746 Div. 8, 25
(TISTP/WH) OTS price $2.60

Technical U., Copenhagen (Denmark).
A SURVEY OF THE LITERATURE ON MIXED PATH PROPAGATION,
by Tove Larsen. Mar 62, 24p. 80 refs. (Technical note no. 1)
(Contract AF 61(052)503)
(AFCRL 62-545) Unclassified report

DESCRIPTORS: *Radio waves, *Propagation, *Terrain, *Bibliography, Topology.

Papers are reviewed which deal with the propagation of radio waves over a ground consisting of areas of various electric constants. The survey is divided into two parts, the first one describing the more or less semiempirical solutions, which have been proposed, the latter describing the more rigorous mathematical methods of calculations, among these the compensation theorem methods, and of use to all mixed path problems. (Author)

AD-282 749 Div. 8
(TISTE/CRJ) OTS price $3.60

Electronic Communications, Inc., Timonium, Md.
PSEUDO RANDOM ARRAY INVESTIGATION,
by J. W. Sherman and M. I. Skolnik. 14 May 62, 35p. incl. illus. tables, 31 refs.
(Technical note no. 1)
(Contract AF 30(602)2626, Proj. 4506)
(RADC TDR 62-304) Unclassified report

DESCRIPTORS: *Antennas, *Antenna radiation patterns, Lobing, Mathematical analysis, Least squares method, Design, Measurement.

Efforts are being made to establish a set of guide-lines for determining the optimum number and spacing of the elements of quasi-random and pseudo-random arrays whereby the elements can be spaced significantly greater than a half-wavelength apart, on the average, and yet retain main beam performance and acceptable side lobe levels. The results of the investigation are to be applicable as a thinning-out technique for a large conventional planar array with between 10,000 and 50,000 elements. The degree of thinning-out varies from 30% to 90%. The antenna parameters that are to be considered in thinning-out are sidelobe enhancement, beamwidth, second order beam suppression, gain, and scanning capability. (Author)

AD-282 754 Div. 8
(TISTE/CRJ) OTS price $9.10

General Electric Co., Syracuse, N. Y.
IMPROVED DELAY LINE TECHNIQUES.
Final rept.,
by S. W. Tehon, R. C. Roberts, and W. C. Wang.
June 62, 97p. incl. illus. tables.
(Contract AF 30(602)2055, Proj. 4506)
(RADC TDR 62-238) Unclassified report

DESCRIPTORS: *Supersonic delay lines, *Piezoelectric transducers, Ceramic materials, Ferroelectric materials, Delay lines, Sound, Sound transmission, Polarization, Attenuation, Radar pulses, Display systems, Television cameras.

Results are presented of a continued program on delay line development. Work concerned the two major areas of dispersive ultrasonic delay lines, and of thin ferroelectric ceramic sheet lines. Ceramic sheet lines were studied theoretically and experimentally, and a number of novel configurations are presented. Ceramic sheet lines offer the possibility of building ultrasonic delay lines with relatively small time delay - bandwidth products having large numbers of taps. Tap spacing can be made less than the resolution time, and transducer reflections are minimal because transducers and delay path utilize the same material, with the same acoustic impedance and with no intermediate bonds. Time - bandwidth product is limited at present by attenuation in ferroelectric ceramic materials suited to this application. One application is described, which provides an ultrasonic means for scanning an image area to provide a raster suitable for television cameras or image display. Dispersive delay line development continued from a previous RADC program. Bandwidths and operating frequencies were increased substantially, strip configurations were developed, and practical lines suitable for pulse compression systems were built, both in breadboard form and in finished packages suitable for system use. The results of operation in a laboratory pulse compression system are presented. (Author)

AD-282 755 Div. 8
(TISTW/RD) OTS price $2.60

Hughes Aircraft Co., Culver City, Calif.
L-BAND PHASE-SHIFTING TECHNIQUES.
Final engineering rept., 1 July 61-16 Mar 62, 16 Mar 62, 15p. incl. illus. table, 2 refs.
(Contract NObsr-81378, Proj. SR-0080302)
Unclassified report

DESCRIPTORS: *Phase shifters, Digital systems, Ferrites, Magnetic fields, Measurement, L band.

A discussion of techniques applicable to obtain digital phase shift without continuously-applied current is given. Also, a phase shifter developed during the program to which the digital techniques are applicable is described. The construction and method of operation of a prototype digital phase shifter is described and the performance is given. Work was performed to determine the cause of variation of insertion loss between the prototype phase shifters. (Author)

TRONS FOR THE 100-300 MC FREQUENCY RANGE.
Quarterly progress rept. no. 8, 1 Apr-1 July 62, by J. E. Boers and G. T. Konrad. July 62, 12p. incl. illus. (Rept. no. 03783-9-P)
(Contract NObsr-81403, Proj. SF-0100201)
Unclassified report

DESCRIPTORS: *Traveling wave tubes, Triodes, Electron guns, Focusing, Electron beams, Electrostatics, Radiofrequency amplifiers, Anodes (Electron tubes), Digital computers, Very high frequency.

Experimental tests on the P sub mu = 4.46 gun with an Einzel lens have been made to determine the optimum geometry of the focusing electrodes for best beam transmission through the gun. A digital computer program to analyze axially symmetric gun and focusing systems has been written and is in the final check-out stage. Provision is made to include space-charge effects in this program. (Author)

AD-282 703 Div. 8
(TISTE/CAM) OTS price $3.60

Radio Corp. of America, Somerville, N. J.
PRODUCTION ENGINEERING MEASURE ON 300 WATT SILICON AUDIO TRANSISTOR,
Quarterly rept. no. 4, 1 Apr-30 June 62, by S. Silverstein and Z. Chang, ed. by A. L. Leotti. 30 June 62, 33p. incl. illus. tables.
(Contract DA 36-039-sc-85968)
Unclassified report

DESCRIPTORS: *Transistors, *Manufacturing methods, *Power amplifiers, *Transistor amplifiers, *Audio amplifiers, Audiofrequency, Design, Silicon, Processing, Voltage, Electrical properties, Thermal conductivity, Resistance, Tests, Measurement, Production.

Electrical data is given for 49 state-of-the-art devices. Distribution plots of current gain and leakage are shown. Thirty units were in the 1-1/16 inch double-ended stud case. Cold sealing procedures are illustrated. The thermal resistance measurement technique is described and typical values are given. The modified power gain setup is described. Four pairs of units were tested. Each pair had power gain in excess of 25 db at 500 watts output. Diffusion, dicing, and aluminum contact alloying operations are described. Some mechanical and environmental results are given. (Author)

AD-282 714 Div. 8
(TISTE/CDM) OTS price $2.60

Microwave Associates, Inc., Burlington, Mass.
HIGH POWER SEMICONDUCTOR PHASE SHIFTING DEVICES.
Quarterly progress rept. no. 2, 1 Apr-30 June 62, by Charles Howell and Joseph White. 30 June 62, 13p. illus.
(Contract NObsr-87291, Proj. SR 008-03-02)
Unclassified report

DESCRIPTORS: *Semiconductors, *Phase shifters, *Microwave equipment, S band, L band, Radiofrequency power, Waveguide couplers, Diodes, Electronic circuits, Tests.

Investigations continued on microwave phase-shifting techniques, other than ferromagnetic and mechanical methods, to provide improved electrical scanning, and to develop models of a phase shifter. A method was investigated for obtaining continuous phase shifts using identical diodes placed in bias opposition at the outputs of a 3-db hybrid coupler. This technique was expected to yield a phase shift characteristic which was less dependent upon the RF power level. Results were obtained which were essentially in agreement with theory, and the advantages and disadvantages of this technique are discussed. (Author)

AD-282 716 Div. 8, 26
(TISTE/CDM) OTS price $1.60

Kuthe Labs., Inc., Newark, N. J.
PRODUCTION ENGINEERING MEASURE FOR A PHASE II SUPER POWER HYDROGEN THYRATRON TUBE.
Quarterly progress rept. no. 1, 7 Mar-6 June 62, by H. E. Krefft. 6 June 62, 17p. incl. illus.
(Contract DA 36-039-sc-85985)
Unclassified report

DESCRIPTORS: *Thyratrons, *Discharge tubes, *Manufacturing methods, Production, Design, Ceramic materials, Electrodes, Anodes (Electron tubes), Cathodes (Electron tubes), Jigs, Radiofrequency power, Hydrogen.

Work was initiated on a stacked, ceramic-metal construction Phase II, super power hydrogen thyratron tube. Design A was developed which features a symmetrical, equal capacitance anode-gradient grid-control grid structure. The anode, both grids, and the base were detailed. Two sets of parts were made and successfully brazed, and one complete envelope assembly was sealed and welded. Experimental work on cathode heater design and assembly was performed. Ceramic rings for the envelope and all materials for electrode construction were received. Brazing, sealing, welding, and inspection jigs and fixtures were constructed. (Author)

AD-282 717 Div. 8, 32, 12
(TISTM/GEC) OTS price $1.75

Lockheed Aircraft Corp., Sunnyvale, Calif.
HIGH-VACUUM EFFECTS ON ELECTRONIC PARTS, MATERIALS, AND RELATED PROBLEMS: AN ANNOTATED BIBLIOGRAPHY,
comp. by Eugene E. Graziano. Apr 62, 62p. 124 refs. (Special bibliography no. SB-62-15; Rept. no. 3-77-62-12)
(Contract AF 04(647)787)
Unclassified report

DESCRIPTORS: *Bibliography, *Electronic systems, *Electronic equipment, Low pressure research, Materials, Sublimation, Vapor pressure, Elastomers, Polymers, Space environmental conditions, Adhesives, Metals, Dielectrics, Plasticizers, Electric insulation, Plastics, Resins, Ceramic materials, Vacuum systems.

A literature survey of technical information regarding experience with electronic parts and materials in high-vacuum environments is presented. Due to the relative sparseness of such information, the scope of the search was extended to include selected references on sublimation, vapor pressures, electronic phenomena in high-vacuum, etc. An intensive search was made for the period, January 1960 - March 1962, and selected references were included to earlier materials if citations were made to these earlier articles in the current literature. (Author)

AD-282 722 Div. 8, 17
(TISTM/GEC) OTS price $2.25

Melpar, Inc., Falls Church, Va.
MOLECULAR CIRCUIT DEVELOPMENT.
Quarterly rept. no. 9, 15 May 15 Aug 62, by Wilbur T. Layton. 15 Aug 62, 86p. incl. illus. tables.
(Contract NOw 60-0362-c)
Unclassified report

SEALING OF HYDROGEN THYRATRON TUBES.
Quarterly progress rept. no. 12, 1 Apr-30 June 62,
by G. H. Dixon. 28 Aug 62, 17p. incl. illus.
(Contract DA 36-039-sc-81289)
Unclassified report

DESCRIPTORS: *Thyratrons, *Glass seals, *Miniature electron tubes, Hydrogen, Seals, Life expectancy, Degasification, Tests, Sealing compounds, Production, Manufacturing methods.

Polyoptic Sealing: During the observations made to determine the influence of polyoptic fit on exhaust pressure, it was found that cleanliness of fit and intimacy were considerably more important to the vacuum tightness than the perfection of spherical shapes. That is between 8 fringes large and 5 fringes small button spherical diameter. The polyoptic assembly procedure has been changed such that an intermolecular bond must be achieved during assembly, prior to sealing. Life Testing Polyoptic Tubes: Preliminary life testing of lot B, sealed during this quarter, indicates a general reduction in life from what had previously been considered as normal life expectancy for polyoptic sealing. No seal failures were observed. Comparative Life Testing Of Flame Sealed Tubes: Due to the fact that only a limited quantity of tubes were tested for 500 hours, no conclusions can be drawn at this time. (Author)

AD-282 903 Div. 8, 14, 26
(TISTN/GEC) OTS price $6.60

Boeing Airplane Co., Seattle, Wash.
CERAMIC DIELECTRIC SANDWICH COMPONENTS.
Final rept., 2 June 60-15 June 61,
by Daniel Auda. 15 June 62, 56p. incl. illus. tables, 21 refs. (Document no. D2-7936-5)
(Contract NOw 60-0050-c)
Unclassified report

DESCRIPTORS: *Radomes, *Ceramic materials, Honeycomb cores, Dielectrics, Processing, Casting, Aluminum compounds, Oxides, Feasibility studies, Physical properties, Thermodynamics, Electrical properties, Ogives, Tensile properties, Impact shock, Mechanical properties, Thermal expansion, Extrusion, Design, Sandwich construction.

The feasibility of fabricating ceramic honeycomb sandwich radomes was studied as an answer to the need for radomes which combine a high strength-to-weight ratio with resistance to extreme environments. After a screening of many ceramic materials and fabrication methods, slipcasting of 97% Al2O3 was chosen as the best means for making dense, accurate parts with good unfired strength and the most satisfactory combination of fired properties. Techniques were devised for assembling and bonding slipcast parts to produce articles ready for firing. Flat sandwich specimens with a longitudinally corrugated core structure were tested for physical, thermal, and electrical properties. Although ogive radomes constructed to determine the feasiblity of fabricating large complex shapes of this structure showed some defects, it is believed these defects could be eliminated by use of more precise tooling. (Author)

AD-282 917 Div. 8
(TISTW/DLW) OTS price $3.60

Coordinated Science Lab., U. of Illinois, Urbana.
TUNNEL DIODE DETECTOR,
by T. Yasui and W. Mayeda. May 62, 34p. incl. illus. 16 refs. (Rept. no. R-138)
(Contract DA 36-039-sc-85122)
Unclassified report

DESCRIPTORS: *Diodes, Detectors, Amplitude modulation, Negative resistance circuits, Electronic circuits, Numerical analysis, Design, Amplifiers.

By use of a tunnel diode, it is possible to design a detector which is capable of amplifying a detected signal. Suppose input signal is an amplitude modulated signal whose modulating signal is es sin omega and the degree of modulation is very small. From the experimental results, the insertion gain ig equals A/B is larger than 14 where A is the peak value of output signal corresponding to es with a tunnel diode being active and B is the peak value of output signal corresponding to es with the tunnel diode being shorted. If the input signal is an amplitude modulated wave with small percentage of modulation, a tunnel diode detector is a very practical circuit which has advantages over an ordinal diode detector. (Author)

AD-282 926 Div. 8
(TISTP/WH) OTS price $1.60

Electrical Engineering Research Lab., U. of Texas, Austin.
THE USE OF THE TMomo CAVITY MODES FOR DIELECTRIC DISTRIBUTION,
by A. P. Deam. 15 July 62, 9p. incl. illus. 4 refs. (Rept. no. 6-47)
(Contract AF 19(604)8038, Proj. 5631)
(AFCRL 62-516) Unclassified report

DESCRIPTORS: *Plasma physics, *Electrons, *Cavity resonators, Frequency shift, Density.

A brief description of the use of TM/omo radial cavity modes to describe radial electron density distribution within a plasma column is given. Frequency shifts were observed for three modes, using a synthetic electron distribution formed by coaxially inserting a styrofoam rod. Accuracies are generally low due to inability to measure the frequency shifts with sufficient accuracy. (Author)

AD-282 930 Div. 8
(TISTW/DLW) OTS price $1.60

David Sarnoff Research Center, Princeton, N. J.
THE VALIDITY OF SCALING PRINCIPLES FOR FIELD-EFFECT TRANSISTORS.
Special scientific report on Investigations of Fundamental Limitations Determining the Ultimate Size of Microstructures,
by T. O. Stanley. 28 Feb 62, 12p. incl. illus.
(Contract AF 19(604)8040, Proj. 5633)
(AFCRL 62-140) Unclassified report

DESCRIPTORS: *Transistors, *Transmission lines, *Microminiaturization (Electronics), Semiconductors, Silicon, Silicon compounds, Dioxides, Electrical properties, Design.

The principles of scaling are described, including the convention of scaling some material property. In particular, semiconductor doping density is scaled inversely with linear dimensions. Electrical scaling exists, by definition, when electrical properties obey some prescribed proportionality to mechanical dimensions. The scaling of transmission lines, field-effect transistors, and bipolar transistors is examined. Transmission lines exhibit a delay time associated with series resistance and distributed capacitance which is a function of geometry but not of scale, on the order of 10 to the -10th power seconds for typical interconnections. Electrical scaling is valid for field-effect transistors, providing doping is scaled inversely with linear dimensions. For this convention, delay time scales linearly, and area power density is invariant with scale. Simple electrical scaling is invalid for bipolar transistors. (Author)

AD-282 766 Div. 8
(TISTE/CRJ) OTS price $5.60

General Dynamics/Astronautics, San Diego, Calif.
SPATIAL FILTERING,
by W. D. Montgomery and P. W. Broome. 1962, 34p. illus. 8 refs.
(Contract AF 04(647)644)
Unclassified report

DESCRIPTORS: *Video filters, Video signals, Detection, Signal-to-noise ratio, Electronic equipment, Linear systems, Simulation, Digital computers, Matrix algebra, Number theory, Statistical distributions, Integral equations, Probability, Theory.

Spatial filtering of two-dimensional pictorial data as an extension of one-dimensional filter theory is applied to the problem of enhancing the detection of localized objects which are superimposed upon a noisy background. Four types of filters are derived. These are the Linear, Quadratic, General Statistical, and Decision filters. Each filter is of the matched type, the different designs being associated with various degrees of knowledge about the noise statistics. A computer simulation of the linear and general statistical filters was done and examples are shown. (Author)

AD-282 768 Div. 8
(TISTE/CDM) OTS price $1.60

Diamond Ordnance Fuze Labs., Washington, D. C.
AN ANALYSIS OF THE TRAVELLING-WAVE CAVITY,
by N. Karayianis and C. A. Morrison. 20 July 62, 20p. incl. illus. 5 refs. (DOFL rept. no. TR-1056)
(DOFL Proj. 26300)
Unclassified report

DESCRIPTORS: *Cavity resonators, *Microwaves, *Waveguide couplers, Theory, Mathematical analysis, Reflection, Tests, Resonance, Radiofrequency power, Attenuation, Phase shifters, Measurement.

An analysis was made of a travelling-wave cavity, showing that the actual response of a typical cavity differs from that predicted by the simple theory. A theoretical analysis indicates that an internal mismatch can explain the observed response. It is further shown that an isolator in the cavity greatly reduces the effect of any mismatch so that the response of the cavity will deviate insignificantly (in the case considered) from the originally expected response. (Author)

AD-282 781 Div. 8
(TISTE/CAM) OTS price $5.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
SOME NOTES ON THE DESIGN OF MICROWAVE STRIPLINE COMPONENTS.
Technical rept. on Ground Digital Electronics,
by Martin Blumberg. 30 Apr 62, 51p. incl. illus. table, refs. (Rept. no. 6-90-62-33)
Unclassified report

DESCRIPTORS: *Transmission lines, *Microwave equipment, *Waveguides, Design, Processing, Materials, Dielectrics, Electric connectors, Waveguide slots, Semiconductors, Waveguide switches, Waveguide couplers.

An account is given of development work in strip transmission lines. Sources of information and of materials are cited. Fabrication processes are described briefly. The designs of typical components, illustrated by sketches, are discussed in relation to the choice of materials and fabrication processes. The development of semiconductor microwave switches in strip transmission line is considered in some detail, with circuit diagrams and oscillograms of waveforms. (Author)

AD-282 786 Div. 8
(TISTP/WH) OTS price $5.60

New Mexico U., Engineering Experiment Station, Albuquerque.
A MODELING TECHNIQUE FOR EXPERIMENTAL VERIFICATION OF DIPOLE RADIATION IN A CONDUCTING HALF SPACE,
by W. E. Blair. July 62, 47p. incl. illus. tables, 20 refs. (Technical rept. no. EE-59)
(Contract Nonr-279801)
Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Sea water, *Propagation, *Dipole antennas, Antenna radiation patterns.

A laboratory-size model of the flat earth-air (two-layer) problem, constructed to verify certain proposed theories on electromagnetic propagation through the sea, is described. The modeling system and technique is used in scaling and measuring electromagnetic field components of electric or magnetic antennas submerged in sea water. (Author)

AD-282 801 Div. 8
(TISTP/TL) OTS price $1.60

Reconnaissance Systems Lab., Mountain View, Calif.
AN APPLICATION OF A NON-PARAMETRIC TECHNIQUE FOR RELIABILITY COMPARISONS,
by Kenneth M. Zenkere and Kenneth M. Hall. 30 July 62, 11p. incl. illus. refs. (Rept. no. 62M6)
Unclassified report

Prepared for the Seventh Symposium on Ballistic Missile and Space Technology, Colorado Springs, 13-16 August 1962.

DESCRIPTORS: *Reliability, *Electronic equipment, Configuration, Mathematical prediction, Probability, Tests, Series, Statistical functions, Sequences, Electron tubes, Hazards, Failure (Mechanics), Life expectancy, Matrix algebra, Analysis.

The basic configuration of the subsystem, involving partial sequential and parallel redundancy, is described and certain special problems arising from the increasing hazard rate (IHR) of one of the blocks are indicated. Two alternative maintenance procedures are considered; one in which a repair action is initiated when a redundant block fails, the other in which failures in the redundant blocks are repaired at scheduled times and preventative maintenance is performed on the IHR block. Models for predicting the mean time between failures (MTBF) of the subsystem for each of these alternates are derived. From these models the relationship between the subsystem MTBF and the failure distribution of the IHR block is determined. A non-parametric method for predicting certain limiting characteristics of the IHR failure distribution on the basis of a small sample censored test is discussed and then applied to predict which of the alternative maintenance procedures can be expected to give the greatest subsystem MTBF. (Author)

AD-282 892 Div. 8, 14, 26
(TISTM/EJH) OTS price $1.60

Chatham Electronics Div., Tung-Sol Electric, Inc., Livingston, N. J.
PRODUCTION ENGINEERING MEASURE FOR POLYOPTIC

two types of internal mounting structures with respect to their resistance and inductance at contract frequencies, and for compliance to specification. The music wire mount is unsatisfactory, the flat spring mount is satisfactory. Many groups were processed at 150 mc, with significant changes in lapping and polishing schedules, in an effort to obtain units with sufficiently low resistance. The final group yielded 20% usable, not sufficient to consider the problem solved, but indicating a reason for optimism that we are on the right track. (Author)

AD-282 964 Div. 8, 26
(TISTE/CRJ) OTS price $1.60

Piezo Crystal Co., Carlisle, Pa.
PRODUCTION ENGINEERING MEASURE VHF CRYSTAL UNITS CR(XM-36)/U.
Quarterly rept. no. 3, 30 Dec 61-29 Mar 62. 29 Mar 62, 16p. incl. illus.
(Contract DA 36-039-sc-85971)
Unclassified report

DESCRIPTORS: *Crystal oscillators, *Quartz crystals, *Manufacturing methods, Production, Very high frequency, Processing, Crystal ovens.

Research continued in an effort to develop and produce 500 quartz crystal units on frequencies 150 mc, 162 mc, 174 mc, 188 mc and 200 mc using both natural and cultured quartz. The design for the 150 mc frequency was tentatively set. Experiments definitely indicate that a lower equivalent series resistance results from higher polishes. The aging oven is being constructed, and the 150 mc units that are acceptable for resistance will be subjected to the required 30-day test. (Author)

AD-282 965 Div. 8, 26
(TISTE/CRJ) OTS price $2.60

Piezo Crystal Co., Carlisle, Pa.
PRODUCTION ENGINEERING MEASURE VHF CRYSTAL UNITS CR(XM-36)/U.
Quarterly rept. no. 4, 30 Mar-29 June 62. 29 June 62, 21p. incl. illus. tables.
(Contract DA 36-039-sc-85971)
Unclassified report

DESCRIPTORS: *Crystal oscillators, *Quartz crystals, *Manufacturing methods, Very high frequency, Production, Processing, Resistance, Crystal ovens.

The design for the 150 mc quartz crystal was confirmed by processing a separate batch of units. These were produced at a satisfactory yield through the finishing operation. An aging oven and associated oscillator were built and tested. Some 150 mc units were aged 14 days at 85 C, part of which were satisfactory, and part not. Extrapolating to 30 days is difficult, but it appears the yield will be about 50%. (Author)

AD-282 978 Div. 8, 15
(TISTP/TL) OTS price $4.60

Stanford Research Inst., Menlo Park, Calif.
COUPLED MODE THEORY FOR ADVANCED MICROWAVE DEVICES.
Interim rept. no. 1,
by M. C. Pease and C. W. Barnes. July 62, 46p. incl. illus. 22 refs.
(Contract AF 33(657)8343, Proj. 4052)
Unclassified report

DESCRIPTORS: *Electron beams, *Microwave equipment, *Parametric amplifiers, *Microwaves, Matrix algebra, Vector analysis, Integral transforms, Linear systems, Topology, Transformations, Frequency, Sequences, Green's function, Partial differential equations, Perturbation theory, Bessel functions, Differential equations, Theory, Propagation.

The principal objectives of this program are to develop and apply a generalized theory of coupled modes of propagation to the study of interactions in distributed microwave devices. The results of these studies should not only provide a deeper understanding of devices currently being used or proposed but may lead to the discovery of new interaction phenomena and provide a basis for the invention of new devices. The areas of specific interest are: (1) topological diagramming methods; (2) simultaneous coupling of more than two modes in a uniform system; and (3) non-uniform systems. The third is an area within the general directive of developing a unified coupled mode theory. Very little is known about the effects of non-uniform coupling. The analytic problems are formidable and only a few cases are soluble in the practical sense by the usual methods. (Author)

AD-282 987 Div. 8
(TISTM/GEC) OTS price $15.50

Texas Instruments, Inc., Dallas.
RESEARCH AND DEVELOPMENT OF AN OPERATIONAL TRANSISTOR FROM InSb.
Final summary rept., 1 June 59-31 Jan 62. Mar 62, 237p. incl. illus. tables, 39 refs.
(Contract NOrd-18902)
Unclassified report

DESCRIPTORS: *Indium compounds, *Transistors, *Intermetallic compounds, Growth, Deformation, Processing, Chemical impurities, Crystal structures, Photoelectric materials, Magnetic effects, Photoelectric effect, Measurement, Scattering, Diffusion, Manufacturing methods, Antimonides, Single crystals.

Considerable improvement in purity and perfection of InSb single crystals was achieved. Crystals grown during the latter part of the contract consistently showed an improvement by a factor of 2 in mobility over those grown earlier. Crystal pulling techniques were developed which allowed single crystals of InSb to be grown with dislocation densities of less than 1/100 sq cm. Segregation coefficients of a number of impurities are reported. Basic studies performed include the use of the photomagnetoelectric effect (PME) to study nonequilibrium transport in p-type InSb. The data suggests: that there is some energy dependence of scattering time which cannot be deduced from these measurements; that the small signal approximation may not be valid even for the lowest photon fluxes available; and that background radiation may be the dominant factor in determining diffusion length. The method used to build n-p-n diffused base, alloyed emitter InSb transistors is described in detail. (Author)

AD-282 990 Div. 8
(TISTW/RD) OTS price $9.60

Westinghouse Electric Corp., Elmira, N. Y.
HIGH TEMPERATURE PHOTOELECTRIC TECHNIQUES AND MATERIALS.
Final technical rept., Apr 59-31 July 61, by Vincent J. Santilli, Harry Shabanowitz, and Zoltan Szepesi. July 62, 59p. illus. 15 refs.
(Contract NObsr-77556)
Unclassified report

DESCRIPTORS: *Photoelectric cells, *Photoelectric materials, *Phototubes, Photoemission, Photosensitivity, Photoconductivity, Camera

AD-282 939 Div. 8, 25
(TISTW/PCR) OTS price $7.60

Electron Tube Research Lab., U. of Minn., Minneapolis.
STUDIES OF PRIMARY ELECTRON SOURCES.
Scientific rept. no. 2, 1 June-1 Sep 61,
by D. E. Anderson. May 62, 45p. illus. table.
(Contract AF 19(604)8381, Proj. 4619)
(AFCRL 62-527)
Unclassified report

DESCRIPTORS: *Thermionic emission, *Cathodes (Electron tubes), Strontium, Radioactive isotopes, Nitrates, Photoelectric effect, Barium compounds, Oxides, Carbonates, Cathodes, Anodes, Tantalum, Tantalum compounds, Aluminum, Temperature, Theory, Sandwich construction, Superconductivity, Optical analysis, Insulating materials, Superconductors, Oxide cathodes.

Results from a controlled chemical activation tube are presented which lend support to the postulate that the thermionic emission from oxide cathodes is proportional to the Sr evolution rate to the one-half power. An oxide coating adherence problem has been encountered which will temporarily suspend radioactive tracer work until a new radioactive nitrate is obtained. A new technique for measuring emission from oxide cathodes during long-pulse and dc conditions is described. Further data on the photoelectric yield and pulse emission of a BaO cathode, obtained by converting $BaCO_3$, are presented. The effects of poisoning this cathode by exposure to a dirty anode and subsequent recovery is illustrated. Photoelectric yield and pulse emission measurements from a thin film BaO coating indicate a relationship between these measurements. (Author)

AD-282 942 Div. 8
(TISTW/DLW) OTS price $1.60

Knights, James, Co., Sandwich, Ill.
VHF QUARTZ CRYSTAL UNITS CR-(XM-38)/U 150 mc TO 200 mc.
Formal rept. no. 3, 1 Apr-30 June 62 on Production Engineering Measure.
30 June 62, 16p.
(Contract DA 36-039-sc-85973)
Unclassified report

DESCRIPTORS: *Quartz crystals, *Crystal oscillators, Very high frequency, Crystal holders, Resistance, Test equipment, Measurement, Harmonic oscillators.

Measurements of the resistance of two different crystal mounts are given. Resistances of 9th harmonic 172 and 174 mc units are given, as well as the resistances of the same units on the fifth and seventh harmonics. These measurements are discussed in detail, and are followed by a discussion of use of the AN/TSM-15 test set. (Author)

AD-282 945 Div. 8
(TISTW/PCR) OTS price $10.10

Microwave Lab., Stanford U., Calif.
EXPERIMENTAL INVESTIGATION OF TRANSMISSION-LINE REPRESENTATIONS OF MICROWAVE PERIODIC CIRCUITS.
Technical note,
by Mary Irene Carswell. Apr 62, 118p. incl. illus. 19 refs. (ML rept. no. 915)
(Contract AF 30(602)2575, Proj. 5573)
(RADC TDR 62-241) Unclassified report

DESCRIPTORS: *Transmission lines, *Waveguides, Microwave networks, Traveling wave tubes, Linear accelerators, Coupling circuits, Waveguide irises, Waveguide couplers.

Research is presented on transmission line models of a type of periodically-loaded waveguide which is important to the design of high power traveling wave tubes and linear accelerators. A simple and well-known model, referred to as the single-line model, is described in terms of a single transmission line periodically loaded with shunt susceptances; the model has the limitation that direct coupling between neighboring irises is not accounted for when the simple one-port element is used to represent the network properties of a thin transverse iris. The model is then improved in such a way that this limitation is removed to a first order of approximation; the iris is assumed to behave as a shunt two-port network coupling smooth transmission lines having the properties of appropriate normal waveguide modes. This latter formulation of the two-port representation of a waveguide iris is new. It is found experimentally that the new model of the structure, referred to as the two-line model, covers a class of circuits used in practical applications. (Author)

AD-282 960 Div. 8, 5
(TISTP/GRW) OTS price $3.60

Pisa U. (Italy).
RECOVERY OF INFORMATION TRANSFERRED INTO PHASE MODULATION IN IONOSPHERIC WAVE PATHS.
Final rept., 1 Feb 61-31 Jan 62,
by Mario Mancianti and Giovanni Marchetti.
Feb 62, 37p. incl. illus. 11 refs.
(Contract AF 61(052)359)
(AFCRL 62-547)
Unclassified report

DESCRIPTORS: *Radio waves, *Ionospheric propagation, *Phase modulation, Radio transmission, Radio receivers, Electronic circuits, Radio signals.

Recovery of the information which though originally impressed onto a signal as amplitude modulation, has been changed to phase modulation by travelling through the ionosphere, was studied. The possibility of an at least partial recovery of the information changed to phase modulation, by means of a double homodyne detector was studied. On the basis of theory, an experimental device which was developed is described, and some of the results obtained are given. With a view to checking its performance, an ionospheric simulator was constructed. This is capable of supplying altered waves, similar to those subject to multiple paths or to sideband rotations. The working principle and circuit diagrams are given, as well as a block diagram of a new device for the recovery of information, which seems to have some advantages over the one already constructed. (Author)

AD-282 963 Div. 8, 26
(TISTE/CRJ) OTS price $2.60

Piezo Crystal Co., Carlisle, Pa.
PRODUCTION ENGINEERING MEASURE VHF CRYSTAL UNITS CR(XM-36)/U.
Quarterly rept. no. 2, 30 Sep-29 Dec 61.
29 Dec 61, 18p. incl. illus. tables.
(Contract DA 36-039-sc-85971)
Unclassified report

DESCRIPTORS: *Crystal oscillators, *Quartz crystals, *Manufacturing methods, Very high frequency, Production, Processing, Crystal holders, Tests, Resistance, Measurement.

Preliminary crystal units at the extremes of the frequency range, 150 mc and 200 mc, were fabricated using the best current techniques. These units were used to evaluate the performance of

A single-diode fixed-tuned degenerate parametric amplifier was built in a simple coaxial configuration and tested for wide-band operation at S-band microwave frequencies. The amplifier consisted of a wide-band circulator, a two-resonator coaxial line equal-ripple filter whose first resonator housed the varactor diode, and a simple pump coupling circuit. With various tunings of the cavity, stable amplification was observed to be typified by: gain = G = 11db, bandwidth = BW = 250 mc, single-sideband noise figure = Fss = 4db; G = 10db, BW = 365 mc, Fss = 5db; G = 19.5db, BW = 120 mc, Fss or 5db; G = 7db, BW = 500 Mc, Fss or 10db. The gains were quite uniform across the signal bands, and the latter were centered on 2.75 gc. The root-gain-bandwidth product was generally from 1000 to 1300 mc. This performance lends general support to the amplifier design theory, and it compares advantageously with the performance of other degenerate amplifiers reported in the literature. Construction features, test circuits, and typical operating characteristics are described. (Author)

AD-283 088 Div. 8, 7
(TISTW/PCR) OTS price $3.60

Electronic Defense Labs., Mountain View, Calif.
EVALUATION OF SPECIAL CONTROL COMPONENTS,
by T. H. Koski, Frederick M. Fonda and others.
6 Apr 62, 33p. incl. illus. 4 refs. (Technical memo. no. EDL-M418)
(Contract DA 36-039-sc-87475)
Unclassified report

DESCRIPTORS: *Servo systems, *Control systems, Electric servomechanisms, Rectifiers, Silicon, Servo motors, Firing circuits, Power amplifiers, Printed circuits, Electric motors, Voltage, Magnetic amplifiers, Relays, Transistor amplifiers, Servo amplifiers, High frequency, Very high frequency, Electronic switches.

New and special components having application in control systems are discussed. Results of evaluation tests made on these components and conclusions on their application are presented. (Author)

AD-283 096 Div. 8
(TISTE/CRJ) OTS price $1.60

ITT Industrial Labs., Fort Wayne, Ind.
PRODUCTION ENGINEERING MEASURE FOR TYPE FW-202 BARRIER GRID STORAGE TUBE.
Quarterly progress rept. no. 4, 1 Apr-30 June 62, by J. M. Abraham. 23 July 62, 16p. incl. illus.
(Serial no. 3215)
(Contract DA 36-039-sc-85967)
Unclassified report

DESCRIPTORS: *Storage tubes, *Manufacturing methods, Electron tubes, Production, Electron guns, Focusing, Targets, Dielectrics, Electrodes, Electrodeposition.

A process for electrophoric deposition of the first layer of enamel on the target was developed and proved very satisfactory. Guns designed to simplify the deflection defocusing correction problem were built and evaluated. Correction curves necessary for building dynamic correction circuits were taken and work started on the building of these units. Fixtures necessary for producing the improved gun were nearly completed. These guns will be fabricated with multiform glass rods. The seal ring for mounting the collector section into the bulb was redesigned and evaluated. (Author)

AD-283 104 Div. 8
(TISTP/FR) OTS price $8.10

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
DIGITAL COMPUTER SIMULATION OF IMPULSE NOISE,
by Robert V. D'Aiello. 31 Oct 61, 81p. incl. illus. tables, 17 refs. (Research rept. no. PIBMRI-967-61)
(Contract AF 18(600)1505)
(AFOSR-1990) Unclassified report

DESCRIPTORS: *Radiofrequency pulses, Data transmission systems, Digital systems, Telephone lines, Errors, Simulation, Digital computers, Statistical analysis, Statistical functions.

A method of using a digital computer to generate probability distributions is described. These distributions can then be used to simulate the effects of impulse noise on the transmission of digital data. The statistics of impulse noise is discussed, and two probability distributions are proposed in order to describe these phenomena. (Author)

## 9. FLUID MECHANICS

AD-281 732 Div. 9, 25
(TISTP/JW) OTS price $7.60

Institute of Engineering Research, U. of Calif., Berkeley.
MEASUREMENT OF PRESSURES, FORCES, AND RADIATING WAVES FOR CYLINDERS OSCILLATING IN A FREE SURFACE,
by J. R. Paulling and Robert K. Richardson.
June 62, 23p. illus. 14 refs. (Series no. 82, Issue no. 23)
(Contract Nonr-22230)
Unclassified report

DESCRIPTORS: *Hydrodynamics, *Cylindrical bodies, *Stresses, Oscillation, Amplitude modulation, Surfaces, Pressure, Wave characteristics.

Experiments are described in which the amplitudes of heave force, pressure at selected girthwise locations, and radiating waves, as well as the phase angles of force and pressure were measured for several heaving cylindrical bodies. These results are compared with theoretical values computed according to Porter's work. Excellent agreement is found between theoretical and measured amplitudes of force and pressure. The agreement for predicted and measured wave heights and for phase angles is substantially good. The feasibility of obtaining total force by a girthwise integration of measured pressures is shown. The results and techniques are expected to shed further light on the problem of the response of a ship to a seaway. (Author)

AD-281 765 Div. 9, 12
(TISTA/SEB) OTS price $2.60

Polytechnic Inst. of Brooklyn, N. Y.
A STUDY OF AERODYNAMIC EFFECTS OF ISOTHERMAL AND TEMPERATURE GRADIENT ATMOSPHERES ON RE-ENTRY TRAJECTORIES,
by Leo Rute. Mar 62, 22p. incl. illus. 10 refs.
(PIBAL rept. no. 738)
(Contract AF 49(638)445, Proj. 9781)
(AFOSR-2411) Unclassified report

DESCRIPTORS: *Re-entry aerodynamics, Flight paths, Re-entry vehicles, Atmosphere entry, Temperature, Deceleration, Mathematical analysis, Atmosphere models, Heat transfer.

tubes, Photomultipliers, Semiconductors, Arsenic compounds, Selenides, Sulfides, Alkali metal compounds, Thermionic emission, Iconoscopes.

Studies and investigations on high-temperature photoelectric techniques and materials were directed toward making available a means of sensing light for photosensitive devices operating in environments up to 120 C. Two general parallel approaches were followed: Approach A - Studies of photoemissive processing techniques and materials leading toward their applications in photomultiplier type tubes. Approach B - Studies of photoconductive processing techniques and materials leading to applications in vidicon type pickup tubes. The prime objective of each approach was supporting research to make possible photosensitive devices operable at elevated temperatures and responsive to low-level visible light such as emitted by cathode ray tube phosphor screens. Materials resulting from these investigations were to be capable of application in tubes in such a manner as to yield extremely uniform sensitivity over photocathode areas and remain stable over a reasonable period of life (100 to 200 hr).

AD-283 020 Div. 8
(TISTE/CAM) OTS price $1.10

Diamond Ordnance Fuze Labs., Washington, D. C.
MAGNETICALLY TUNABLE MICROWAVE BANDPASS FILTER,
by Frank Reggia. 29 June 62, 13p. incl. illus. 5 refs. (Rept. no. TR-1043)
(Proj. 26321)
Unclassified report

DESCRIPTORS: *Band-pass filters, *Waveguide filters, Tuning circuits, Cavity resonators, Magnetic fields, Dielectrics, Ferrites, Electrical properties, Microwave frequency, Measurement, Microwave equipment, Ferromagnetic materials.

Dispersive magnetic properties of magnetized ferrites were utilized at microwave frequencies in the design of special purpose components. Objectives of the ferrite development program were to increase this family of available microwave components and to decrease prevalent technical limitations in microwave systems and associated test equipment. One of the recent microwave ferrite components developed is a small magnetically tuned bandpass filter, designed in half-height rectangular waveguide for use at 3-cm wavelength. These microwave bandpass filters consist of a single rectangular ferrite resonant cavity (0.125 in. x 0.200 in. x 0.500 in.) having a tuning range of 1000 mc, a transmission bandwidth of approximately 100 mc, a rejection bandwidth of 4000 mc and an insertion loss of approximately 1.2 db at the center of the pass band. The small ferrite cavity is resonant in the fundamental TE011 mode, and the magnetic control field is applied perpendicular to the waveguide axis. (Author)

AD-283 053 Div. 8
(TISTW/PCR) OTS price $3.60

General Telephone and Electronics Labs., Inc., Bayside, N. Y.
THIN FILMS FORMED BY ELECTROCHEMICAL REACTIONS.
Quarterly rept. no. 4, 1 Mar-31 May 62,
by E. R. Bowerman, J. Warren Culp, and P. F. Hudock. 30 June 62, 33p. incl. illus. 1 ref.
(Rept. no. TR 62-5.5)
(Contract DA 36-039-sc-87305)
Unclassified report

DESCRIPTORS: *Thin films, *Electrochemistry, Capacitors, Tantalum, Resistors, Anodes (Electrolytic cell), Oxidation, Aluminum, Niobium, Titanium, Tungsten, Zirconium, Microminiaturization (Electronics), Electronic circuits, Vacuum apparatus.

The preparation of several hundred thin-film Ta capacitors confirmed previous findings that the type of glass and the cleaning procedure used were necessary for obtaining high-quality capacitors. With the preparation of a large number of capacitors, data have been obtained on the uniformity of capacitance values. Improvements in both uniformity and electrical characteristics resulted from a reduction of the substrate temperature during tantalum sputtering, from the treatment of the sputtering mask and from spectroscopic monitoring for impurities in the glow discharge. The evaluation of electrical properties was extended to cover a range of frequencies and temperatures. The preparation of thin-film resistors by anodization of sputtered and vacuum-evaporated Ta was accomplished. Resistance was reproducible to within 0.3% of the desired value. The films were evaluated for power dissipation, and the temperature coefficient of resistance was determined as a function of sheet resistivity and film thickness. (Author)

AD-283 084 Div. 8
(TISTP/FR) OTS price $1.60

Centro Radioelettrico Sperimentale ''G. Marconi'' (Italy).
SPORADIC-E IONIZATION OBSERVED BY THE BACKSCATTER TECHNIQUE,
by P. Dominici. 15 Feb 62, 8p. illus. 4 refs.
(Technical note no. 9)
(Contract AF 61(052)139)
(AFCRL 62-395) Unclassified report

DESCRIPTORS: *Atmospheric sounding, Radio waves, High frequency, Scattering, Earth, Statistical analysis, Periodic variations.

Results of ionospheric sounding by ground backscatter carried out to determine the occurrence of propagation via sporadic-E ionization is discussed. The seasonal and diurnal occurrence, as well as the azimuthal distribution of the Es echoes are discussed. There was a good correlation between the time occurrence of Es echoes and the occurrence of Es ionization, the top frequency of which exceeds a critical value related to the frequency of the sounding radio waves. To account for a lack of correlation between the azimuthal distribution of the echoes and the azimuthal distribution of foEs, it is suggested that the latter one depends even on an azimuthal variation of the vertical radiation diagram of the antenna, due to some characteristics of the ground. Statistical analysis of Es clouds was performed from May to July 1961; about 60% of the observed clouds were moving clouds, their main movement occurring toward the southwest. The mean dimension of these clouds was about 250 km. (Author)

AD-283 087 Div. 8
(TISTE/CRJ) OTS price $3.60

Electronic Defense Labs., Mountain View, Calif.
PERFORMANCE OF A WIDE S-BAND PARAMETRIC AMPLIFIER,
by Alex Mayer and Albert Camps. 18 Apr 62, 31p. incl. illus. 3 refs. (Technical memo. no. EDL-M453)
(Contract DA 36-039-sc-87499)
Unclassified report

DESCRIPTORS: *Parametric amplifiers, Microwave amplifiers, Electronic circuits, S band, Diodes, Cavity resonators, Circuits, Transmission lines, Waveguides, Tests.

variables in these hodograph equations results in a complicated differential equation, which is discussed briefly. Finally, the approximate equations appropriate to each transition are derived, and simple solutions exhibiting these transitions are given. (Author)

AD-281 899 Div. 9, 25
(TISTP/JW) OTS price $8.60

Itek Corp., Lexington, Mass.
DIFFRACTION STUDIES.
Final rept.,
by Richard Barakat. June 62, 69p. illus. 5 refs.
(Contract AF 19(604)8466, Proj. 4600)
(AFCRL 62-365) Unclassified report

DESCRIPTORS: *Electromagnetic theory, *Diffraction, Microwaves, Antennas, High frequency, Intensity, Luminescence, Optics, Vector analysis, Boundary layer.

From a stochastic generalization of the Green-Wolf complex scalar potential of electromagnetic theory, it has been concluded that the Green-Wolf complex scalar potential does not offer any simplifying advantages when applied to the solution of electromagnetic boundary value problems. A number of unsuccessful attempts were made to circumvent these difficulties by application of judicious approximations. The situation is different at high frequencies such as encountered in optical diffraction or microwave antennas. Here no attempt is made to solve the complete boundary value problem and attention is focused upon the behaviour of the far field patterns. A scalar description of these problems is adequate for low numerical apertures. In high numerical aperture systems, there are a number of difficulties associated with the definition of intensity or illuminance. If the complex scalar potential is utilized, it rigorously represents the electromagnetic field and the illuminance can be set equal to the mean electromagnetic energy density according to the prescription of the complex scalar theory of Green and Wolf. (Author)

AD-281 911 Div. 9, 25
(TISTP/JW) OTS price $1.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
EXPERIMENTAL HEAT TRANSFER TO BLUNT AXISYMMETRIC BODIES NEAR THE LIMIT OF CONTINUUM FLOW,
by J. Leith Potter and John T. Miller. Aug 62, 13p. incl. illus. tables, 16 refs. (Rept. no. AEDC TDR 62-155)
(Contract AF 40(600)1000, Proj. 8953)
Unclassified report

DESCRIPTORS: *Heat transfer, *Blunt bodies, Fluid flow, Boundary layer, Wind tunnels, Reynolds number, Density, Temperature.

Measurements of average heat-transfer rates to blunt-nosed, axisymmetric, cold-walled bodies in a low-density, hypervelocity wind tunnel are given. Stream density was such that Reynolds and Knudsen numbers, based on nose radius and conditions immediately behind the bow shock, varied from 5 to 20 and 0.11 to 0.056, respectively. Thus, scaling on the basis of Knudsen number, these conditions may be said to simulate a body of one-foot nose radius at as much as 315,500-ft altitude. Heat-transfer rates are discussed in relation to the flow model successfully used in the past for studies of flows of high Reynolds number. In this context, it was found that measured heat-transfer rates to hemispheres below shock-layer Reynolds numbers of 20 exhibited a decreasing nondimensionalized rate relative to that estimated by methods appropriate to high Reynolds number conditions. This behavior is in accord with various applicable theories. Rates for the flat-faced bodies showed no tendency to decrease, and they were somewhat higher than predicted by theories for high Reynolds numbers. (Author)

AD-281 914 Div. 9, 25
(TISTP/JW) OTS price $1.60

Armour Research Foundation, Chicago, Ill.
STUDY OF FACSIMILE SCANNING AND RECORDING TECHNIQUES EMPLOYING FIBER OPTICS.
Quarterly rept. no. 1, 15 Jan-15 Mar 62,
by D. A. Pontarelli and P. N. Slater. 15 Apr 62, 17p. incl. illus. (Rept. no. ARF 1203-4)
(Contract DA 36-039-sc-88927)
Unclassified report

DESCRIPTORS: *Fibers, *Optics, *Data processing systems, *Facsimile recording systems, Illumination, Reflectors, Recording devices, Optical glass, Optical systems.

Facsimile copy can be illuminated and scanned by fiber optics. For diffuse copy the design of the scan and illumination fiber geometry is determined by the desired resolution, separation of fiber ends from the copy and the diameter and numerical aperture of the fibers. For copy in which surface gloss may obscure the base contrast the illumination-scan fiber sheet geometry can be designed to reject the gloss component of surface reflectivity. Expressions which describe the optical properties and the geometric relationship of a generalized combination of fibers and copy resulting in the rejection of the gloss or 'mirror' reflections have been derived. The fiber is fabricated as a single strand which is mechanically assembled into an aligned fiber sheet or some other configuration. Fiber breakage during the assembly of the fiber sheets and the use of a fiber optics component is dependent upon the tensile strength of the fiber. Optical glasses of similar and varied expansion coefficients and softening points were surveyed and a number of combinations chosen for fiber fabrication. (Author)

AD-281 944 Div. 9, 25
(TISTP/JW) OTS price $4.60

Naval Ordnance Lab., White Oak, Md.
FIRST ORDER SLIP EFFECTS ON THE PLANE COUETTE FLOW OF A DISSOCIATING GAS,
by K. R. Enkenhus. 1962, 38p. illus. 8 refs.
Unclassified report

3rd International Symposium on Rarefied Gas Dynamics, June 26-30, 1962, Paris, France.

DESCRIPTORS: *Heat transfer, *Fluid flow, Gases, Friction, Oxygen, Freezing, Viscosity, Velocity, Temperature, Dissociation.

An analysis is made of the first order slip effects on the skin friction and heat transfer of a parallel flow of a reacting gas next to a catalytic surface at which atom recombination and slip occur. Calculations were made for oxygen for three limiting cases - equilibrium flow, frozen flow with a fully catalytic wall, and frozen flow with a non-catalytic wall. It was found that the presence of slip reduces the ratio of Stanton number to friction coefficient in all cases, but causes an increase rather than a decrease in skin friction at high free-stream temperatures or velocities. This is due to the fact that the temperature jump and change in atom concentration at the wall increase the viscosity by a larger amount than the presence of slip reduces the wall velocity gradient. (Author)

The behavior of skip and impact trajectories of space vehicles entering an atmosphere in which temperature varies with altitude is studied. The atmosphere is divided into layers, each of which is characterized by an appropriate temperature gradient. Numerical results for heat transfer rates, relative decelerations and altitude as functions of flight time, and an altitude-range history for STD Day (ARDC Model Atmosphere, 1959) Hot and Cold Day, are presented for selected re-entry conditions. These results are compared with those obtained in an isothermal (exponential) atmosphere for the same re-entry conditions. The difference in peak heat transfer rates and maximum relative decelerations in the two atmospheric models is not significant for properly selected scale heights. However, the effect of temperature variation upon minimum elevation for the skip trajectory and upon range to point of impact for impact trajectories is noticeable. (Author)

AD-281 870 Div. 9, 25
(TISTP/JW) OTS price $2.60

Smith, E. H., and Co., Inc., Silver Spring, Md.
TRAVELLING WAVES ON TORPEDO-LIKE BODIES.
Final rept.
July 62, 18p. incl. 2 refs.
(Contract NOw 61-0505-c)
Unclassified report

DESCRIPTORS: *Fluid flow, *Torpedo bodies, Surfaces, Vortex generators, Drag, Boundary layer, Wave characteristics, Cylindrical bodies.

This study of travelling waves on prolate spheroids concentrated on strict application to torpedo shaped bodies. A previous study in which flexural waves, imposed on the axis of the torpedo, was conducted. This study was supplemented with a similar calculation for waves on the skin of the torpedo. The report contains all the design formulas necessary for skin drag reduction (or skin propulsion) applications to torpedoes. Further consideration of the vortex wake was, attempted. It was found, however, that the vortices are formed along the body of the fish in a very complicated manner and no satisfactory basis for an analytical treatment was found. (Author)

AD-281 877 Div. 9
(TISTP/GRW) OTS price $6.60

Boeing Scientific Research Labs., Seattle, Wash.
THE INFLUENCE OF VISCOSITY ON THE FLOW OF GASES THROUGH LONG TUBES AND SLOTS,
by F. Edward Ehlers. May 62, 70p. incl. illus. 9 refs. (Mathematical note no. 257; Document no. D1-82-0168)
Unclassified report

Also available from the author.

DESCRIPTORS: *Viscosity, *Adiabatic gas flow, Boundary layer, Axially symmetric flow, Pipes, Friction, Differential equations.

The isothermal and adiabatic flows of a viscous gas through a long straight channel were analyzed under the assumptions of constant wall temperature, a Prandtl number of unity, and a parabolic boundary layer velocity profile. Two regimes of flow were found. For inlet Mach numbers below a critical value, the boundary layer builds up and eventually fills the channel. The ratio of the length of this inlet region to the Reynolds number based on inlet conditions was found as a function of the inlet Mach number. The influence of this inlet region on the pressure distribution in fully developed viscous channel flow is presented in the form of a length correction to the fornulae for isothermal flow. For Mach numbers greater than the critical value, the boundary layer thickness attains a maximum value without filling the entire cross section, and the flow in the center core then becomes choked. Graphs are given from which it is possible to estimate the mass flow through a long choked channel when the stagnation conditions of the flow and the geometry of the channel are known. (Author)

AD-281 879 Div. 9
(TISTA/WAW) OTS price $6.60

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
SOME ASPECTS OF MAGNETOHYDRODYNAMIC FLOW ABOUT A BLUNT BODY,
by B. P. Leonard. June 62, 38p. illus. 11 refs.
(Contract AF 49(638)544)
(AFOSR-2714) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, Fluid flow, Blunt bodies, Vortices, Vector analysis, Integral equations, Partial differential equations, Mathematical analysis.

Electromagnetic body forces are nonconservative. The effects of such forces are studied here in the case of inviscid incompressible flow about a blunt body. The nonlinear simultaneous partial differential equations describing the flow can be solved in various regimes corresponding to certain values of two parameters: Rm, the magnetic Reynolds number, and A where A to the -1/2 power is the Alfven number. For the case of small Rm, and small magnetic force coefficient, S, equations can be derived which are linear and independent. These are solved for some particular unsteady flows, and the results show that, in these cases, vorticity is introduced in such a way that it is independent of time. The equations are linearized by using the velocity field of ordinary hydrodynamics (OHD) in the convective derivatives. This technique is valid for all Rm provided either A or S is small. For large Rm, it results in a solution showing a boundary-layer character. Two results are of interest. First, the appearance of the downstream non-diffusive trail of vorticity in the small Rm, small S case. Secondly, the fact that for all cases studied the region of significant current density is close to the body, and any wake-like effect is either highly diffusive (small Rm) or extremely weak (large Rm ). (Author)

AD-281 880 Div. 9, 15
(TISTP/JW) OTS price $8.60

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
THE THEORY OF ALIGNED-FIELDS MAGNETOGASDYNAMIC FLOWS,
by A. R. Seebass. June 62, 85p. incl. illus. 28 refs.
(Contract AF 49(638)544)
(AFOSR-2715) Unclassified report

DESCRIPTORS: *Magnetic fields, *Fluid flow, Linear systems, Differential equations, Transformations (Mathematics), Functions, Dynamics.

The isentropic flow of an ideal conductor in the presence of a magnetic field is treated for the case of aligned fields. Particular attention is paid to flow regimes where the existing linearized theory fails because of a change in character of the governing equations. The equations for the stream function and a new potential function are derived, and the behavior of their characteristics determined. These equations are then transformed to hodograph variables, in which they become linear. Several exact solutions are considered in detail. Separation of

DESCRIPTORS: *Flying platforms, Ground effect, Stability, Control, Surfaces, Jets, Flight testing.

An experimental investigation was performed of the dynamic response characteristics of the Princeton 20-foot annular jet Ground Effect Machine and the U. S. Army Transportation Research Command 15-foot 'Hula-Hoop.' The tests ranged from dynamic stability and control responses to performance and for the P-GEM also the operation over specially prepared test tracks simulating various conditions of rough terrain. The P-GEM successfully negotiated all prepared obstacles. The calculated values of frequency and damping ratio from existing two-dimensional theories are found to be inadequate for the prediction of the dynamic characteristics of the test vehicles. (Author)

AD-282 123 Div. 9, 1
(TISTA/WAW) OTS price $3.60

Skycraft, Inc., Fort Worth, Tex.
EXPLORATORY FULL-SCALE GROUND AND FLIGHT TEST EVALUATION OF THE ROBERTSON ULTRA-LOW SPEED FLIGHT CONTROL SYSTEM,
by James Livingston Robertson. May 62, 34p. incl. illus. 9 refs. (Rept. no. SRQ-4)
(Contract DA 44-177-tc-702, Proj. 9R38-11-009-10)
(TCREC TR 62-23) Unclassified report

DESCRIPTORS: *Vertical take-off planes, *Short take-off planes, Control surfaces, Stability, Control, Maintenance, Take-off, Airplane landings, Flight testing, Aerodynamics, Subsonic flow, Control systems.

The results of an exploratory full-scale ground and flight test evaluation of the stability, control, performance, handling, and maintenance characteristics of the Robertson Ultra-Low-Speed Control System (ULS) are presented. The (ULS) consists of a small set of aerodynamic control surfaces placed immediately behind the propeller disk and permanently connected to the airplane's conventional flight control system. The results of this program showed that, at 40 mph., the ULS increased pitch, yaw, and roll control powers to 256, 280, and 250%, respectively, of basic airplane values. This increase also reduced the airplane's minimum speed from a control-limited 40 to a power-limited 20 mph with an attendant 50% reduction in landing and take-off distance. Glide angle was increased from 10 to 20 degrees through installation of the new system. The ULS installation did not appreciably affect stability or handling qualities, and caused no ''oversensitivity'' at maximum speed (168 mph). Test results indicate that the rudimentary ULS system tested is a light, simple, and inexpensive way of generating the powerful low-speed control moments required for V/STOL operation. (Author)

AD-282 125 Div. 9, 1
(TISTA/WAW) OTS price $8.60

Aeronutronic, Newport Beach, Calif.
HOVERING STATIC STABILITY AND PERFORMANCE EXPERIMENTS ON THREE-DIMENSIONAL ANNULAR JET MODELS,
by B. H. Carmichael and D. E. McNay. Nov 61, 92p. incl. illus. (Pub. no. U-1443)
(Contract DA 44-177-tc-709)
(TCREC TR 62-36)
Unclassified report

DESCRIPTORS: *Flying platforms, Aerodynamics, Stability, Stability (Lateral), Stability (Longitudinal), Lift, Stabilization, Flaps, Control surfaces, Ground effect, Jets, Wind tunnel models, Model tests.

Hovering static stability and performance experiments have been conducted with a series of three-dimensional annular jet models. The model planforms measured 40 by 20 in. and incorporated 1-in. thick jets operated at a total pressure of 41.5 pounds per square foot. Height-length ratios of 0.05 to 0.20 were investigated. Simple vertical and 45 degree inclined peripheral jets demonstrated static longitudinal stability at low heights and instability at high heights. Static lateral instability existed for both models at all heights. Convex and concave base shaping with a depth equal to 5% of the model length did not appreciably affect stability in either pitch or roll. A rigid skirt together with rigid base segmenting flaps of length equal to 5% of the model length were effective in augmenting longitudinal and lateral stability when they extended two-thirds the way to the ground, but were not very effective when they extended only half way to the ground. The order of increasing effectiveness of segmenting flap configuration was concentric, corner lobe, and centerline. The configurations investigated were not optimized for hovering performance. The configurations are, however, representative of compromises which occur due to forward flight considerations. (Author)

AD-282 126 Div. 9
(TISTP/WH) OTS price $2.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
ASYMMETRIC INVISCID MODES OF INSTABILITY IN COUETTE FLOW,
by F. E. Bisshopp. July 62, 21p. incl. illus. (Technical rept. no. 48)
(Contract Nonr-56207, Proj. NR 062-179)
Unclassified report

DESCRIPTORS: *Stability, *Gas flow, *Cylindrical bodies.

An approximate solution of the equation which governs the inviscid modes of instability of steady flow between concentric rotating cylinders is derived. The problem is treated in the narrow gap approximation, and the solution is applicable over the entire range of opposite rotation rates, but is limited to the treatment of disturbances which are nearly axially symmetric. Numerical results are given for the limiting cases where the ratio of angular velocities of the cylinders approaches zero and minus infinity. It is found that the growth rates of unstable modes, which are very nearly symmetric, are always less than the growth rate of the corresponding axisymmetric mode. (Author)

AD-282 127 Div. 9
(TISTA/GEC) OTS price $5.60

Boeing Scientific Research Labs., Seattle, Wash.
A STUDY OF THE SLENDER TWO-DIMENSIONAL BODY OF MINIMUM DRAG USING THE NEWTON-BUSEMANN PRESSURE COEFFICIENT LAW,
by Angelo Miele. Aug 62, 37p. illus. 9 refs. (Flight Sciences Lab. technical rept. no. 61; Document no. D1-82-0178)
Unclassified report

Also available from the author.

DESCRIPTORS: *Aerodynamic configurations, *Hypersonics, Drag, Pressure, Boundary layer, Fluid flow, Cylindrical bodies, Theory, Mathematical analysis.

An investigation was made of the problem of minimizing the drag of a slender, two-dimensional body in hypersonic flow under the assumption that the pressure coefficient law is New-

# Division 9 - FLUID MECHANICS

AD-282 002 Div. 9, 1
(TISTA/SEB) OTS price $1.25

Aerojet-General Corp., Azusa, Calif.
BASIC PRINCIPLES OF THE INDICIAL LIFTING-SURFACE FLUTTER-ANALYSIS PROCEDURE.
Final rept. on Dynamic Problems in Flight Vehicles,
by Bernard Mazelsky and Harry B. Amey, Jr.
May 62, 38p. incl. illus. table, 2 refs. (Rept. no. 2134)
(Contract AF 33(616)7420, Proj. 1370)
(ASD TDR 62-44) Unclassified report

DESCRIPTORS: *Flutter, Wings, Triangular wings, Swept wings, Aerodynamics, Theory, Mathematical prediction, Hypervelocity vehicles, Lift, Elasticity, Damping, Hypersonics, Mathematical analysis.

A method of flutter analysis utilizing indicial functions to represent the unsteady aerodynamics is described. Basic concepts are illustrated for a two-dimensional wing; the extension to a spanwise distorting wing is also discussed. Significant aerodynamic parameters pertinent to a highly swept, hypersonic delta wing are reviewed. For these wings the principal factor for adequate prediction of flutter is determination of the steady and quasi-steady aerodynamic influence coefficients. The unsteady contributions are shown to have a negligible effect on the flutter characteristics. (Author)

AD-282 040 Div. 9, 25, 30
(TISTP/JW) OTS price $4.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
TRANSMISSION TESTING ON ALASKAN FORWARD-PROPAGATION TROPOSPHERIC SCATTER CIRCUIT,
by P. L. Grant. 29 May 62, 1v. incl. illus. 2 refs. (Rept. no. 25G-9)
(Contract AF 19(604)7400)
(AFESD TDR 62-103) Unclassified report

DESCRIPTORS: *Atmospherics, *Data transmission systems, Errors, Digital computers, Circuits, Failure (Mechanics), Scattering, Alaska.

During the period 7 July through 9 August 1961, digital data were transmitted over a forward-propagation tropospheric scatter circuit in Alaska, and observations were made in order to evaluate the performance of this circuit in a data transmission channel. The COded BIphase (COBI) was the modem used. The circuit, routed from Ketchikan to Anchorage, was 858.7 miles in length. Error rates were established. Occurrence of errors is related, insofar as possible, to the records of equipment failures, dropouts, and circuit failures contained in the daily log. (Author)

AD-282 082 Div. 9, 12
(TISTA/SEB) OTS price $7.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
HEATING PROBLEMS OF ENTRY INTO PLANETARY ATMOSPHERES FROM SUPERCIRCULAR ORBITING VELOCITIES,
by Sinclaire M. Scala. Oct 61, 55p. illus. 59 refs. (Rept. no. TIS R61SD176)
(Contract NASr-32) Unclassified report

Presented at the USAF ARDC ASD Symposium on Aerothermoelasticity, Dayton, Ohio, October 30-November 1, 1961.

DESCRIPTORS: *Re-entry aerodynamics, *Symposia, *Heat transfer, *Planetary atmospheres, Flight paths, Re-entry vehicles, Transport properties, Thermodynamics, Convection, Thermal radiation, Supersonics, Ionization, Lift, Elasticity, Viscosity, Enthalpy, Diffusion, Temperature, Ions, Specific heat, Aerodynamic heating, Atmosphere entry.

A brief review is given of the influence of trajectory parameters on the severity of the environmental conditions to which a vehicle traveling at supercircular velocities in a planetary atmosphere will be exposed. The governing equations for the determination of heat transfer in partially ionized gases are discussed. Currently available theoretical techniques of estimating the transport and thermodynamic properties of partially ionized gases are reviewed, and inadequacies are summarized. Available theories for predicting the convective (aerothermochemical) and radiative heat transfer at superorbital flight speeds are discussed, and new theoretical and experimental results are given for the effects of ionization upon convective stagnation point heat transfer. Some estimates are given of the anticipated thermal stress levels which will be encountered during lifting re-entry from outer space. Finally, an integrated approach to the determination of the solution to the aero-thermo-viscoelastic problem of supercircular flight is outlined. (Author)

AD-282 093 Div. 9
(TISTP/TL) OTS price $2.60

Boeing Scientific Research Labs., Seattle, Wash.
OPTIMUM SLENDER TWO-DIMENSIONAL BODIES IN NEWTONIAN FLOW,
by Angelo Miele. July 62, 20p. illus. tables, 6 refs. (Flight Sciences Lab. rept. no. 60; D1-82-0177)

Also available from the author.

DESCRIPTORS: *Bodies of revolution, *Airfoils, *Hypersonic flow, Drag, Analysis, Angle of attack indicators, Moments, Pressure, Differential equations, Integral equations.

The problem of minimizing the drag of a slender, two-dimensional body in Newtonian flow at zero angle of attack is considered. A generalized closed form expression is obtained for the optimum shape which is valid regardless of the conditions imposed on the thickness, the length, the enclosed area, and the moment of inertia of the contour. This expression contains as particular cases those valid when any two of these four quantities are fixed while the remaining are free. If either of the two specified quantities is the thickness, the expression for the shape of the body is a power law; more specifically, the exponent of this law is 1 if the thickness and the length are given, 3/2 if the thickness and the enclosed area are given, and 3 if the thickness and the moment of inertia of the contour are given. For all of the cases considered here, analytical expressions are derived for the thickness ratio and the drag coefficient. Also, in order to verify the minimal properties of the solutions obtained, the optimum shapes are compared with each other. (Author)

AD-282 119 Div. 9, 1
(TISTA/WAW) OTS price $9.60

Kellett Aircraft Corp., Philadelphia, Pa.
AN EXPERIMENTAL INVESTIGATION OF THE RESPONSE CHARACTERISTICS OF TWO MAN-CARRYING GROUND EFFECT MACHINES.
Rept. for May 60-Jan 61,
by A. A. Perlmutter and M. M. George. Apr 62, 102p. incl. illus. 12 refs. (Rept. no. 212X90-2)
(Contract DA 44-177-tc-733)
(TCREC TR 62-28) Unclassified report

DESCRIPTORS: *Ship hulls, *Hydrodynamics, *Fluid mechanics, *Digital computers, Bodies of revolution, Vector analysis, Partial differential equations.

A method is described for calculating, with the aid of an electronic computer, the incompressible potential flow about arbitrary, non-lifting, three-dimensional bodies. The method utilizes a source density distribution on the surface of the body and solves for the distribution necessary to make the normal velocity zero on the boundary. Plane quadrilateral surface elements are used to approximate the body surface, and the integral equation for the surface source density is replaced by a set of linear algebraic equations for the values of the source density on each of the quadrilateral elements. After this set of equations has been solved, which is accomplished by a Seidel iterative procedure, the flow velocities at points both on and off the body surface are calculated. This approach is completely general. Bodies are not required to be slender, analytically defined, or simply connected. (Author)

AD-282 277 Div. 9, 25
(TISTP/JW) OTS price $1.75

Dayton U. Research Inst., Ohio.
RESEARCH ON SYSTEMS FOR PRODUCTION OF HIGH TEMPERATURE AND HIGH DENSITY GASES (PRESSURE ENERGY EXCHANGE PRINCIPLE).
Rept. for 15 Apr 61-14 June 62 on Mechanics of Flight,
by John E. Minardi and Robert B. Schwartz.
July 62, 58p. incl. illus. 7 refs.
(Contract AF 33(616)6417, Proj. 7063)
(ARL 62-398) Unclassified report

DESCRIPTORS: *Energy, *Gases, Pressure exchangers, Liquids, Compressible flow, Pressure, Deceleration, Fluid flow, Nozzles, Density, Exchange reactions, High temperature research.

Research on a pressure energy exchange principle, conducted to determine the feasibility of various pressure energy exchange apparatus to produce isolated high temperature and high pressure gas is described. The theoretical analysis and test results of a 200 atmosphere gas driver system and the development of a liquid driver system are emphasized. The test results of the 200 atmosphere gas driver system, which utilizes the work of expansion of a high pressure driver gas to compress an initially low pressure charge gas, are compared with a thorough theoretical analysis. Severe mixing of the driver and charge gases has been found to degrade the performance to such an extent as to regard the system tested as inadequate for the production of high temperature, high pressure pure air. The initial results of a liquid driver system, in which the charge gas is rapidly compressed as it decelerates a high speed column of liquid, indicate that this concept is worthy of future development. Studies are also discussed which were directed towards tailoring a tube or nozzle to eliminate Taylor instability for use in systems in which mechanical separation is not desirable. (Author)

AD-282 335 Div. 9, 25
(TISTP/WH) OTS price $2.60

Southampton U. (Gt. Brit.).
ON THE MAINTENANCE OF CHEMICAL EQUILIBRIUM DURING THE EXPANSION OF REACTING GAS MIXTURES. THE OPTIMUM NOZZLE DESIGN,
by J. P. Appleton. Mar 62, 13p. illus. 8 refs.
(Technical note no. 13; AASU rept. no. 216)
(Contract AF 61(052)250)
(ARL 62-385) Unclassified report

DESCRIPTORS: *Gas flow, *Superaerodynamics, *Chemical equilibrium, *Reaction kinetics.

A criterion is presented which may be applied to control the expansive flow of reacting gas mixtures, thus ensuring that a state close to chemical equilibrium is always maintained. The criterion has been used as the basis of a method for determining the optimum equilibrium nozzle shape for air over a range of stagnation conditions. (Author)

AD-282 336 Div. 9
(TISTA/SEB) OTS price $3.60

Tulane U., New Orleans, La.
HEAT TRANSFER FROM THE REAR OF BLUFF OBJECTS TO A LOW SPEED AIR STREAM.
Final technical rept. on Mechanics of Flight,
by H. H. Sogin. June 62, 28p. incl. illus. tables, 6 refs.
(Contract AF 33(616)8481, Proj. 7063)
(ARL 62-361) Unclassified report

DESCRIPTORS: *Blunt bodies, Aerodynamic configurations, Metal plates, Temperature, Wind tunnel models, Model tests, Laminar boundary layer, Turbulent boundary layer, Subsonic flow, Jet mixing flow, Convection, Heat transfer.

The local heat transfer by forced convection from the base surface of a blunt obstacle in a variety of configurations has been measured. The data are satisfactorily correlated by an equation, where the properties are evaluated at the mean film temperature. The coefficient C depends upon the configuration and the location on the rear surface. Devices that close the dead-air space, or reduce its size, reduce the value of C. Thus, C has practically the uniform value 0.20 for a flat-plate strip at 90-degree angle of attack; but at 25-degree angle of attack it changes from 0.09 sub 3, where the apparent free streamline changes direction through an obtuse angle, to 0.18 where the apparent free streamline changes direction through an acute angle. (Author)

AD-282 372 Div. 9
(TISTP/FR) OTS price $5.60

Fluid Dynamics Research Lab., Mass. Inst. of Tech., Cambridge.
INVESTIGATION OF SPHERICAL SHOCK WAVES IN A SHOCK TUBE,
by Robert Nantu Teng. Feb 62, 30p. illus. 6 refs. (Scientific rept. no. 62-1)
(Contract AF 19(604)5698, Proj. 7673)
(AFCRL 62-416) Unclassified report

DESCRIPTORS: *Shock waves, *Shock tubes, Conical nozzles, Orifices, Photographic analysis, Schlieren photography.

A shock tube was constructed for investigating spherical shock waves in various atmospheres. The shock tube was carefully calibrated for its performance throughout the designed operating range. Thin-film heat transfer gauges were employed to measure the speed of the incident shock wave. Shadowgraph technique was used to establish the geometry of the spherical shock waves which were produced by either allowing the center portion of the incident shock to enter an orifice and then allowing it to expand into a spherical shock wave at the entrance of the orifice upon reflection from the end or utilizing the high temperature, high enthalpy gas behind the reflected shock wave to expand through a conical nozzle. Attempts were made to measure the speed of the spherical shock waves. (Author)

ton's impact law as modified by Busemann to include centripetal acceleration effects. After the condition that the pressure coefficient be non-negative is accounted for and after arbitrary conditions are imposed on the thickness, the length, the enclosed area, and the moment of inertia of the contour, the minimal problem is formulated as a problem of the Mayer type and solved by the combined use of the Euler-Lagrange equations, the transversality condition, the Erdmann-Weierstrass corner conditions, and the properties of the switching function. The class of solutions was determined such that, among the four quantities being considered (the thickness, the length, the enclosed area, and the moment of inertia of the contour), two are prescribed while the remaining are free. (Author)

AD-282 130 Div. 9
(TISTA/SEB) OTS price $9.60

Firestone Flight Sciences Lab., Calif. Inst. of Tech., Pasadena.
AN EXPERIMENTAL INVESTIGATION OF THE EFFECT OF A TRANSVERSE HYPERSONIC FLOW VELOCITY UPON A LOW-DENSITY D.C. ELECTRICAL DISCHARGE IN AIR.
Rept. on Hypersonic Research Project,
by Gary L. Marlotte. 15 June 62, 105p. incl. illus. (Memo. no. 66)
(Contract DA 04-495-ORD-3231)
Unclassified report

DESCRIPTORS: *Hypersonic flow, *Electric discharges, Hypersonic wind tunnels, Air, Electrodes, Plasma physics, Ionization, Ions, Velocity, Density, Boundary layer, Tests, Hypersonics, Theory, Gas flow, Test equipment.

Experiments were carried out with air in the GALCIT 5-inch by 5-inch hypersonic wind tunnel with a nominal Mach number of 5.8. DC breakdown voltages and steady-state sub-normal glow voltages were measured across a channel formed by two sharp-edged insulating flat plates in which flat-plate Rogowski electrodes were embedded. Segmented electrodes were used in the normal glow regime to measure current distributions at each electrode for various electrode segment combinations, total currents, and densities. For the characteristic dimensions and speeds involved, the explicit dependence of electrical breakdown upon the velocity of the stream is small compared to the effect of boundary layer density defects. A theoretical treatment of breakdown is given and qualitative agreement with experiments is obtained. In the normal glow regime using segmented electrodes, an unmistakable explicit flow velocity effect was observed, with the discharge current paths being displaced downstream compared to static bell-jar tests at equivalent densities. (Author)

AD-282 138 Div. 9, 25, 20
(TISTP/JW) OTS price $8.60

Florida U., Gainesville.
AN EXPERIMENTAL STUDY OF THE INTERACTION OF PLASMONS AND FAST ELECTRONS IN METALS AND A STUDY OF ELECTRON TUNNELING THROUGH THIN INSULATING FILMS.
Final technical rept., 15 Oct 60-14 June 62,
by W. B. Ard, Jr. 14 June 62, 91p. incl. illus. refs.
(Contract AF 49(638)956)
(AFOSR-2937) Unclassified report

DESCRIPTORS: *Energy, *Plasma physics, Thin films, Metallic films, Insulating materials, Electrons, Density, Electric currents, Metals, Excitation, Superconductivity.

AD-282 167 Div. 9, 25
(TISTP/WH) OTS price $8.60

Flight Dynamics Lab., Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
SOME OBSERVED ELECTRO-GASDYNAMIC PROPERTIES OF FLUID FLOWS.
Rept. on Electromechanics Phenomena,
by James Clark. Mar 61, 91p. incl. illus. 6 refs. (Technical memo. no. 61-11)
(Proj. 1366)
Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Electromagnetic waves, *Electromagnetic fields, *Gas flow, *Fluid flow, *Electromagnetic properties, *Vortices, Shock waves, Turbulent flow, Crystal structure, Iron alloys, Erosion, Ions, Cavitation, Gas ionization, Shock tubes, Tests, Heat transfer, Photographic analysis, Schlieren photography, High temperature research, Thermal stresses, Electrochemistry, Heat exchangers, Oscilloscope probes.

In the aerodynamic field, definite electromagnetic radiation was observed and recorded from shock waves in a glass shock tube. Electromagnetic radiation was also obtained from a stationary shock wave in a gas turbine research nozzle. Tests in the hydrodynamic field indicated that electromagnetic fields were also radiated from turbulent regions in fluid flows. Tests in the solid state field verified the hypothesis that an interaction occurs between bodies having electric charges and the crystal lattices of high temperature ferrous alloys. This memorandum describes tests conducted in each of these fields and the data obtained. The results of these carefully conducted tests indicate the existence of a definite interrelationship between electromagnetic fields and various other parameters in the fields of aerodynamics, hydrodynamics, and solid states. (Author)

AD-282 232 Div. 9
(TISTP/JW) OTS price $1.10

Aeronutronic, Newport Beach, Calif.
TWO-DIMENSIONAL HYDRODYNAMICS COMPUTATIONAL PROGRAM.
Monthly progress rept. no. 1,
by R. A. Grandey. 15 June 62, 1p. (Publication no. MPR-62-103)
(Contract DA 04-495-ORD-3513)
Unclassified report

DESCRIPTORS: *Warheads, *Hydrodynamics, Computers, Fluid flow, Impact shock, Design.

AD-282 234 Div. 9, 25, 15
(TISTP/JW) OTS price $1.60

Aerospace Information Div., Washington, D. C.
PROPAGATION OF ELECTROMAGNETIC WAVES IN PLASMA ACROSS AN EXTERNAL MAGNETIC FIELD.
Special trans.,
11 July 62, 13p. 3 refs. (AID rept. no. 62-102)
Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Plasma physics, Electrons, Linear systems, Partial differential equations, Translations, Density, Propagation.

AD-282 255 Div. 9, 30
(TISTP/WH) OTS price $12.50

Douglas Aircraft Co., Long Beach, Calif.
CALCULATION OF NON-LIFTING POTENTIAL FLOW ABOUT ARBITRARY THREE-DIMENSIONAL BODIES,
by John L. Hess and A. M. O. Smith. 15 Mar 62, 177p. incl. illus. (Rept. no. ES 40622)
(Contract Nonr-272200)
Unclassified report

Investigation continued of one facet of a potentially important technological advance in minimizing skin-friction drag of both aircraft and hydrocraft. The method investigated consists in favorably modifying the natural boundary-layer flow by means of distributed damping, as opposed to the more widely investigated distributed-suction method. Several features of the distributed-damping method of laminar-flow control are of particular interest for potential vehicular applications: no pumps, associated power sources, or ducts are required within the vehicle; and the stabilizing surface coating applied to the vehicle has a smooth, impermeable surface that is not subject to clogging. The structural material of stabilizing coatings requires primarily a low modulus of elasticity combined with great resiliency, or low inherent damping. Natural rubber is unsatisfactory, since its resiliency is poor at low moduli of elasticity. It is concluded that improved hydraulic performance of the known coating designs can be achieved by using a material with appreciably less inherent damping than rubber, but equal modulus of elasticity. (Author)

AD-282 735 Div. 9
(TISTA/VGW) OTS price $2.60

Aerospace Corp., Los Angeles, Calif.
STAGNATION POINT HEAT TRANSFER MEASUREMENTS IN HYPERSONIC LOW REYNOLDS NUMBER FLOWS,
by Robert L. Varwig. 5 June 62, 18p. incl. illus. table, 7 refs. (Rept. no. TDR-930(2230-11)TN-2)
(Contract AF 04(647)930)
(DCAS TDR 62-125) Unclassified report

DESCRIPTORS: *Hypersonic flow, *Cylindrical bodies, *Spheres, Wind tunnel models, Aerodynamic heating, Shock waves, Hypersonic wind tunnels, Model tests, Mathematical analysis, Mathematical analysis, Mathematical prediction, Heat transfer, Hypersonics.

Measurements have been made of heat transfer rates at the stagnation point of cylinders and spheres for hypersonic flow at Reynolds numbers from 5 to 500 based on nose radius. A comparison of the measurements with the predictions of Probstein and Kemp, Ferri, Zakkay and Ting, and H. K. Cheng is considered. It is concluded that, within the experimental error, ordinary boundary layer theory can be used to predict the heat transfer rates down to stagnation point Reynolds numbers of twenty. At this point, the heat transfer rate increases somewhat as predicted, reaching the free molecule value at a Reynolds number between two and three. (Author)

AD-282 891 Div. 9
(TISTP/FR) OTS price $2.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
THE TRAPPING EFFECT IN CRYOPUMPING,
by J. D. Haygood and E. S. J. Wang. Aug 62, 25p. incl. illus. table, 7 refs. (Rept. no. AEDC TDR 62-133)
(Contract AF 40(600)1000)
Unclassified report

DESCRIPTORS: *Diffusion pumps, *Adsorption, Vacuum systems, Cryogenics, Air, Water vapor, Nitrogen, Liquefied gases.

A theoretical analysis of the trapping phenomenon is presented, based on the assumptions of adsorption and solution of the trapped gas. Supporting experimental data are given at total pressures ranging from 1/100,000 to 1/100 mm Hg for the trapping of air by water condensate on a spherical cryosurface at liquid nitrogen temperature. (Author)

AD-282 897 Div. 9
(TISTA/SEB) OTS price $1.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
HYPERSONIC STATIC STABILITY OF BLUNT SLENDER CONES,
by Jack D. Whitfield and W. Wolny. Aug 62, 8p. incl. illus. table, 5 refs. (Rept. no. AEDC TDR 62-166)
(Contract AF 40(600)1000)
Unclassified report

DESCRIPTORS: *Conical bodies, *Blunt bodies, Stability, Pitch, Mathematical analysis, Theory, Wind tunnel models, Model tests, Hypersonics.

Correlations of measured normal-force and pitching-moment coefficients from blunt, slender cones have been obtained. These correlations are based on simple Newtonian theory to illustrate the parametric relationships. The correlated data include measurements from 10 blunt cones tested in the VKF (Mach 8 to Mach 20) and measurements from three sharp cones tested at NASA Langley (Mach 9.6). The Mach number 'independence' of these essentially inviscid perfect gas hypersonic static stability data is clearly evident. (Author)

AD-282 901 Div. 9
(TISTA/SEB) OTS price $7.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
AN ANALYSIS OF NONEQUILIBRIUM INVISCID FLOWS,
by W. E. Gibson and A. Sowyrda. Aug 62, 61p. incl. illus. tables, 19 refs.
(Contract AF 40(600)928)
(AEDC TDR 62-172) Unclassified report

DESCRIPTORS: *Blunt bodies, *Gas flow, *Hypersonic flow, Analysis, Mathematical analysis, Recombination reactions, Shock waves, Theory, Equations, Enthalpy, Dissociation, Spheres, Hypersonics.

An analytic solution is developed for blunt-body flows involving nonequilibrium chemistry. The chemical model describes a diatomic gas with a single dissociation recombination reaction. The progress of the reaction is determined behind the bow shock under conditions of vibrational equilibrium. The analysis seeks an improved understanding of the structure of the chemical relaxation zone along streamlines, in particular, its dependence on flow parameters. In high-altitude flight, three-body recombination becomes ineffective and dissociation or binary scaling can be applied. The range of validity of binary scaling is found and the implications for hypersonic testing are discussed. The analytic approach also applies for cases where recombination is important, including equilibrium flow. Numerical examples are given for spherical bodies and for a range of body sizes and flight altitudes. (Author)

AD-282 904 Div. 9
(TISTP/FR) OTS price $2.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
TRAPPING AND SORPTION OF NONCONDENSABLE GASES IN THE COLD DIFFUSION PUMP,
by J. E. Nichols. Aug 62, 26p. incl. illus. tables, 5 refs. (Rept. no. AEDC TDR 62-124)
(Contract AF 40(600)1000)
Unclassified report

DESCRIPTORS: *Diffusion pumps, Cryogenics, Vacuum systems, Adsorption, Water, Carbon tetrachloride, Nitrogen.

# Division 9 - FLUID MECHANICS

AD-282 408 Div. 9, 6
(TISTP/FR) OTS price $1.60

David Taylor Model Basin, Washington, D. C.
HYDRODYNAMIC CHARACTERISTICS OF THE XU-1245 VARIABLE-DEPTH-TRANSDUCER HOUSING,
by Arthur P. Brisbane. July 62, 16p. (Rept. no. 1654)
Unclassified report

DESCRIPTORS: *Towed bodies, Transducers, Underwater sound equipment, Hydrodynamics.

Tests were conducted to determine the hydrodynamic characteristics of a full-scale XU-1245 Variable-Depth-Transducer Housing designed by the U.S. Navy Underwater Sound Laboratory. The towing characteristics were observed to be satisfactory over a speed range from 0 to 12 knots. The pressure-compensating device provided for the transducer appeared to operate satisfactorily. Computer studies, based on measurements of towline angle and tension, indicate that the housing will meet the design requirements for speed and towing depth at sea. (Author)

AD-282 436 Div. 9
(TISTP/GRW) OTS price $1.60

Mechanical Technology Inc., Latham, N. Y.
A NOTE ON THE STABILITY OF FLOW IN NON-CONCENTRIC ANNULI,
by R. C. DiPrima. 14 Aug 62, 13p. incl. illus. 13 refs. (Rept. no. MTI-62TR15)
(Contract Nonr-373100)
Unclassified report

DESCRIPTORS: *Bodies of revolution, *Lubrication, *Fluid flow, Cylindrical bodies, Vortices, Rotating structures, Stability.

At the thin film widths encountered in journal bearing lubrication, it is reasonable to expect that the instability of the flow between two concentric rotating with the inner cylinder rotating will occur in the form of Taylor vorticies. For continuous fluid films in non-concentric annuli Taylor vorticies can also be expected to occur as observed by Coles. In this case a pressure gradient is set up around the cylinders, and this effect was considered by examining the stability characteristics of the local velocity profiles at various cross sections. (Author)

AD-282 482 Div. 9
(TISTA/GEC) OTS price $2.60

Polytechnic Inst. of Brooklyn, N. Y.
APPROXIMATE SOLUTIONS FOR MELTING AND ABLATION PROBLEMS,
by Thomas J. Lardner. June 62, 22p. illus. 21 refs. (PIBAL rept. no. 654)
(Contract Nonr-83923, Proj. NR 064-433)
Unclassified report

DESCRIPTORS: *Ablation, *Melting, Mathematical analysis, Re-entry vehicles, Satellite vehicles, Thermodynamics, Thermal conductivity, Re-entry aerodynamics, Aerodynamic heating, Theory.

A comparison is presented between the exact solution and the approximate solutions obtained by the heat balance integral method and Biot's variational principle for the Stefan problem and the problem of ablation of a semi-infinite solid. The application of the variational principle and some of its shortcomings are discussed, in addition to an indication of the areas of disagreement between the exact and the approximate solutions. (Author)

AD-282 651 Div. 9
(TISTA/GEC) OTS price $5.60

Aeronautical Research Lab., Office of Aerospace Research, Wright-Patterson Air Force Base, Ohio.
HYPERSONIC VISCOUS FLOW OVER CONES AT NOMINAL MACH 11 IN AIR,
by John D. Anderson, Jr. July 62, 48p. incl. illus. 14 refs. (Rept. no. ARL 62-387)
(Proj. 7064)
Unclassified report

DESCRIPTORS: *Conical bodies, Aerodynamics, Hypersonic flow, Theory, Model tests, Wind tunnel models, Pressure, Laminar boundary layer, Fluid flow, Hypersonics.

Experimental results were obtained on weak-interaction, self-induced pressures on cones at nominal Mach 11 in air using the ARL 3-inch continuous flow hypersonic wind tunnel. The results at zero angle of attack were compared with Probstein's first-order weak-interaction theory (AD-66 227) and with Talbot's numerical method for predicting self-induced pressures (AD-204 704). Theory agreed well with the experimental data for 5-degree and 10-degree semivertex angle cones, but overestimated the experimental induced pressures for 15-degree and 20-degree cones. The results were correlated reasonably well by the hypersonic viscous-interaction parameter and the hypersonic similarity parameter. The experimental results obtained for the 10-, 15-, and 20-degree cones at angles of attack from -15 to 15 degrees compared favorably with Newtonian theory for angles of attack greater than 3 degrees. For values less than 3 degrees, Newtonian theory did not agree with the experimental results. (Author)

AD-282 675 Div. 9
(TISTA/GEC) OTS price $1.60

Naval Ordnance Test Station, China Lake, Calif.
SOLUTION AND USE OF A PARTICULAR INTEGRAL ARISING IN A DETERMINATION OF THE INDUCED VELOCITY FIELD OF A SHROUDED ROTOR,
by W. A. Middleton. Aug 62, 10p. 3 refs.
(NOTS TP 2953)
(NAVWEPS rept. no. 7927)
Unclassified report

DESCRIPTORS: *Shrouded propellers, *Rotor blades, Aerodynamics, Velocity, Load distribution, Mathematical analysis, Integral equations, Theory, Vortices.

A closed expression for the integral $\int_0^{\pi} \sin p\theta (\cos\theta - \cos\phi)^{-1} d\theta$ is obtained for any integer p and $0 < \phi < \pi$ by solving a recursion formula. The solution is applied to determine the induced velocity components due to a finite number of helical vortex sheets for the case of a finite loading on the tip of a ducted rotor. (Author)

AD-282 683 Div. 9
(TISTA/GEC) OTS price $3.60

RAND Corp., Santa Monica, Calif.
MATERIAL REQUIREMENTS FOR BOUNDARY-LAYER STABILIZING COATINGS-WATER APPLICATION,
by M. O. Kramer. Aug 62, 27p. incl. illus. tables, 4 refs. (Memo. no. RM-3018-PR)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: *Coatings, *Boundary layer control, Theory, Laminar boundary layer, Drag, Reduction, Fluid mechanics, Damping, Stabilization, Elasticity, Friction, Skin, Tests, Test methods, Surface properties, Mechanical properties, Tensile properties, Laminates, Biology, Hydrodynamics, Design, Underwater.

AD-281 774 Div. 10
(TISTM/EJH) OTS price $4.60

Rocketdyne, Canoga Park, Calif.
RESEARCH IN HYBRID COMBUSTION.
Quarterly progress rept. for period ending 30 May 62,
by M. V. Peck and T. Houser. 30 June 62, 37p. incl. illus. tables, 7 refs. (Rept. no. R-2267-7)
(Contract Nonr-301600)
Unclassified report

DESCRIPTORS: *Hybrid rocket propellants, *Combustion, Diffusion, Flames, Solids, Gases; Heat transfer, Thermal conductivity, Turbulent flow, Gas flow, Polymers, Acrylic resins, Styrenes, Aluminum, Oxygen, Theory, Photographic analysis.

The equations derived from the simplified hybrid combustion theory based upon a diffusion flame model are applicable to turbulent gaseous flow upon proper definition of the parameters. The well-defined flame front is substantiated by movies taken at the end of the combustor. The complementary approach of examination of the solid phase heat conduction is being explored. (Author)

AD-281 818 Div. 10, 16
(TISTM/EJH) OTS price $3.00

General Chemical Div., Allied Chemical and Dye Corp., New York.
RESEARCH ON MATERIALS AND METHODS FOR DECONTAMINATION OF TOXIC MISSILE PROPELLANT SPILLAGE.
Final rept. for Jan 61 to Dec 61 on Toxic Hazards of Propellants and Materials,
by J. M. Siegmund, R. B. Jackson and others.
June 62, 170p. incl. illus. tables, 42 refs.
(Contract AF 33(616)7672, Proj. 6302)
(ASD TDR 62-64) Unclassified report

DESCRIPTORS: *Liquid rocket propellants, *Hydrazines, *Methyl hydrazines, *Tetroxides, *Pentaboranes, *Rocket oxidizers, *Fluorides, *Decontamination, Chlorine compounds, Nitrogen compounds, Ammonia, Water, Ammonium radicals, Hydroxides, Carbonates, Bicarbonates, Sodium compounds, Foams, Powders, Sprays.

Decontaminants for five toxic missile propellants; nitrogen tetroxide, chlorine trifluoride, hydrazine, unsymmetrical dimethylhydrazine, and pentaborane, are discussed. The work for each propellant was divided into: a comprehensive literature survey; a study of possible chemical reactions with respect to probable effectiveness, nature of end products, and heats involved; and the testing of materials for their neutralizing capability with the various propellants. The most effective decontaminant for each propellant was developed based on this work; however, if a common decontaminant for all five propellants is required, dilute aqueous solutions of ammonia appear to offer the best potential. (Author)

AD-281 851 Div. 10
(TISTM/GEC) OTS price $23.50

Aerojet-General Corp., Sacramento, Calif.
STUDY OF MECHANICAL PROPERTIES OF SOLID ROCKET PROPELLANTS. APPENDIXES A THROUGH G.
Rept. for 30 Jan 61-30 Jan 62,
by Harry H. Hilton, A. J. Durelli and others.
Mar 62, 490p. incl. illus. tables, 62 refs.
(Rept. no. 0411-10F)
(Contract AF 33(600)40314)
Unclassified report

DESCRIPTORS: *Solid rocket propellants, *Propellant grains, Tensile properties, Structures, Stresses, Analysis, Creep, Deformation, Photoelasticity, Elasticity, Temperature, Pressure, Acceleration, Failure (Mechanics), Test methods, Differential equations, Mathematical analysis, Viscosity, Mathematical properties, Analysis.

Contents:
Analytical determination of generalized, linear viscoelastic stress-strain relations from uniaxial, biaxial, and triaxial experimental creep and relaxation data.
Survey and development of methods for the determination of strains in solid propellants.
Parameter calculations of simple propellant grains for temperature cycling, pressurization, and acceleration.
Stress analysis of propellant grains using displacement equations.
Finite difference solution of ordinary and partial differential equations.
Studies relating to structural analysis of solid propellants.
Investigation of the failure of solid fuels under combined stresses.

AD-281 852 Div. 10
(TISTM/GEC) OTS price $21.00

Aerojet-General Corp., Sacramento, Calif.
STUDY OF MECHANICAL PROPERTIES OF SOLID ROCKET PROPELLANTS.
Rept. for 30 Jan 61-30 Jan 62,
by James H. Wiegand. Mar 62, 376p. incl. illus. tables, 102 refs. (Rept. no. 0411-10F)
(Contract AF 33(600)40314)
Unclassified report

DESCRIPTORS: *Solid rocket propellants, *Propellant grains, Tensile properties, Structure, Stresses, Creep, Deformation, Photoelasticity, Elasticity, Temperature, Pressure, Failure (Mechanics), Hydrostatic pressure, Configuration, Mathematical analysis, Bonding, Viscosity, Mechanical properties, Analysis.

A study was made concerning methods for measuring the mechanical properties of composite solid propellant, and for analyzing the response behavior for values essential to stress analysis. Theoretical and experimental stress analysis were performed on simple tubular grains to establish failure criteria, and develop a method of integrating such experimental and theoretical processes with the grain design and propellant development functions to give an optimum method of grain design for reliable solid propellant motors. (Author)

AD-282 055 Div. 10
(TISTM/GEC) OTS price $7.60

Rohm and Haas Co., Huntsville, Ala.
ENGINEERING RESEARCH.
Quarterly progress rept., 15 June-15 Sep 61,
by Gerald F. Gillis and Charles H. Parr.
25 June 62, 66p. incl. illus. refs. (Rept. no. P-61-17)
(Contract DA 01-021-ORD-5135)
Unclassified report

DESCRIPTORS: *Solid rocket propellants, *Propellant grains, Elasticity, Viscosity, Photoelasticity, Pressure, Aging, Deformation, Stresses, Mathematical analysis, Tensile properties, Acceleration, Mechanical properties.

A method of numerical solution was developed for obtaining the stresses, strains, and displacements in a solid propellant grain of finite length subject to loadings of pressure, cure and thermal shrinkage, and axial acceleration. Although the method is applicable to any solid of revolution, the development was restricted to a propellant grain in the form of hollow, right,

Continuing research on an experimental cryogenic diffusion pump as a vacuum pumping device is described with special emphasis on the effects of trapping and adsorption. By the use of pumping fluids that have large trapping capacities, it was possible to pump N2 gas with the cold diffusion pump without a forepump while the condensing wall was at liquid nitrogen temperature. The pumping speeds for this system, with and without a forepump, are presented, using H2O and CCl4 as pumping fluids and N2 as the test gas. The trapping of hydrogen and helium by water at 77 K was not observed experimentally. (Author)

AD-282 924 Div. 9, 31
(TISTP/WH) OTS price $4.60

Edo Corp., College Point, N. Y.
THE EQUILIBRIUM CONFIGURATION OF A TOWED HYDROFOIL-STRUT SYSTEM IN TWO-DIMENSIONAL STEADY TURNS,
by P. A. Pepper and J. Streich. 13 Apr 62, 41p. incl. illus. 2 refs. (Rept. no. 5741)
(Contract Nonr-385200)
Unclassified report

DESCRIPTORS: *Hydrofoils, *Hydrodynamics, *Towed bodies.

The solution is presented of an idealized problem involving the towing of a hydrofoil-strut system in a still fluid. The system consists of a hydrofoil of finite mass connected to the towing vehicle (towpoint) by a rigid strut of constant cross-section and uniform mass distribution, the hydrofoil being attached to the strut end in such a way that it always operates at a fixed lift coefficient. The towpoint moves in a circular path with constant speed and both strut and foil are restricted to the plane of the towpoint's motion. The hydrodynamic force assumed to act on the strut is that commonly used for flexible cables; i.e., a running normal load proportional to the square of the normal component of local velocity. Thus, fluid tangential (friction) forces are neglected as well as those reactions (virtual mass effects) associated with perfect fluids. In addition to the absence of gravity, the other simplifying assumption used is the neglect of hydrofoil drag. (Author)

AD-282 925 Div. 9
(TISTP/WH) OTS price $2.60

Connecticut U., Storrs.
THE SHOCK WAVE PRODUCED BY COLLAPSE OF A SPHERICAL CAVITY,
by R. S. Brand. June 62, 28p. incl. illus. 2 refs. (Technical rept. no. 1)
(Contract Nonr-329201)
Unclassified report

DESCRIPTORS: *Cavitation, *Shock waves.

The results of the computations for a single case of spherical cavity collapse in water are presented, including the post-collapse shock wave and accompanying velocity and pressure fields. For the model studied it appears that at a finite time after collapse negative pressures occur, indicating that the cavity reopens. (Author)

AD-283 011 Div. 9
(TISTA/VGW) OTS price $5.60

Boeing Scientific Research Labs., Seattle, Wash.
A STUDY OF THE SLENDER BODY OF REVOLUTION OF MINIMUM DRAG USING THE NEWTON-BUSEMANN PRESSURE COEFFICIENT LAW,
by Angelo Miele. Aug 62, 38p. illus. tables, 9 refs. (Flight Sciences Lab. technical rept. no. 62; Document no. D1-82-0186)
Unclassified report

Also available from the author.

DESCRIPTORS: *Bodies of revolution, *Cylindrical bodies, Hypersonic flow, Mathematical analysis, Boundary layer, Pressure, Acceleration, Aerodynamic configurations, Hypersonics, Drag.

The problem of minimizing the drag of a slender body of revolution in hypersonic flow is investigated under the assumption that the pressure coefficient law is Newton's impact law as modified by Busemann in order to include centripetal acceleration effects. After the condition that the pressure coefficient be non-negative is accounted for and after arbitrary conditions are imposed on the diameter, the length, the wetted area, and the volume, the minimal problem is formulated as a problem of the Mayer type and solved by the combined use of the Euler-Lagrange equations, the transversality condition, the Erdmann-Weierstrass corner conditions, and the properties of the switching function. Particular attention is devoted to the class of solutions such that, among the four quantities being considered (the diameter, the length, the wetted area, and the volume), two are prescribed while the remaining are free. For all of the cases considered here, analytical expressions are obtained for the optimum shapes. The optimum shapes are compared in order to verify the minimal properties of the solutions. (Author)

## 10. FUELS AND COMBUSTION

AD-281 713 Div. 10
(TISTM/AW) OTS price $3.60

Aeronutronic, Newport Beach, Calif.
STUDY OF DETONATION BEHAVIOR OF SOLID PROPELLANTS. Quarterly rept. no. 2,
by M. H. Boyer, R. A. Grandey and others.
20 July 62, 36p. incl. illus. tables, 5 refs.
(Publication no. U-1764)
(Contract NOw 62-0503-c)
Unclassified report

DESCRIPTORS: *Solid rocket propellants, *Propellants, *Explosives, *Detonation, Equations of state, Urethanes, Bismuth, Reaction kinetics, Detonation waves, Propellant grains, Pressure, Theory, Combustion, TNT.

Data are presented on calculated minimum pressure for initiation of detonation in a double-base propellant. Good agreement with experiment is found, but the meaning of the agreement is uncertain because of uncertainty in the equation of state data used. The dependence of wave trajectories and reaction zone profiles upon a grain surface ignition versus a point ignition model is investigated. Evidence indicates that point ignition gives theoretical behavior more closely paralleling experimental behavior. Two dimensional calculations are presented showing the energy deposition resulting from passage of a shock over a bubble in a solid charge. Deposition is larger in the region of the bubble than elsewhere. The problem has not been carried to completion because it was found that a rather long running time would be required. Preliminary data on the experimental investigation of equation of state on polyurethane is presented. (Author)

Temperature increase of the metal case resulting from premature exposure of the case insulation
Method for determining the burning propellant surface area as a function of time based on an experimental combustion chamber pressure

AD-282 440 Div. 10
(TISTM/MS) OTS price $1.60

Instituto Nacional de Tecnica Aeronautica (Spain).
COMBUSTION OF SOLID AND LIQUID PROPELLANTS AND FLAME THEORY.
Final rept., 1 Feb 59-31 Mar 62,
by Carlos Sanchez Tarifa. 1 May 62, 15p.
11 refs. (Technical rept. no. 1)
(Contract AF 61(052)221)
Unclassified report

DESCRIPTORS: *Liquid rocket propellants, *Solid rocket propellants, *Flames, Flame propagation, Chemical reactions, Diffusion, Combustion, Theory.

An analytical study on the influence of chemical kinetics on the combustion of liquid bipropellant in droplets was made. The influence of chemical kinetics on premixed and diffusion spherico-symmetrical flames was studied. A research facility was constructed and experiments were carried out in order to study the influence of pressure and temperature of the surrounding atmosphere on solid propellant combustion. A theoretical study on the influence of heat losses and radical diffusion on the structure of premixed flames was carried out. A criterion for the validity of the steady state assumption for radical concentration was obtained. And, in order to study the influence of chemical kinetics on laminar diffusion flames, their external and internal structures were analyzed. As a result, a criterion for flame extinction was obtained. (Author)

AD-282 519 Div. 10
(TISTM/MS) OTS price $5.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
AN EXPERIMENTAL INVESTIGATION OF POSSIBLE ALUMINUM ADDITIVE CONTRIBUTIONS TO UNSTABLE COMBUSTION IN SOLID ROCKET PROPELLANTS,
by Leland A. Watermeier, William P. Aungst, and Samuel P. Pfaff. July 62, 61p. incl. illus. tables, 13 refs. (BRL rept. no. 1168)
(Proj. 517-06-002)
Unclassified report

DESCRIPTORS: *Rocket propellants, *Combustion, Aluminum, Solid rocket propellants, Photographic analysis, Additives, Powder metals.

Composite - double base rocket propellant slabs which contained different concentrations and particle sizes of aluminum were burned in a transparent-walled chamber. The chamber was exhausted to the atmosphere. The slabs were ignited in cigarette fashion and burned under ambient nitrogen pressures of 200-800 psi. Experimental runs were made under steady flow conditions and under oscillating conditions with a siren rotating over the exhaust port. Motion pictures were taken of the burning process at high framing rates. Data on droplet burning and concentrations in various regions above the propellant surfaces were obtained from individual frames of the film. (Author)

AD-282 603 Div. 10, 4
(TISTM/MS) OTS price $4.60

Reaction Motors Div., Thiokol Chemical Corp., Denville, N. J.
FLAME CHARACTERISTICS OF THE DIBORANE-HYDRAZINE SYSTEM.
Rept. on A Cooperative Program of Fundamental Research as Related to Jet Propulsion,
by M. Vanpee, A. Clark, and H. G. Wolfhard.
June 62, 26p. illus. tables, 6 refs. (Proj. Squid technical rept. no. RMD-2-P)
(In cooperation with James Forrestal Research Center, Contract Nonr-185825, Proj. NR-098-038)
Unclassified report

Paper presented at the Ninth International Symposium on Combustion held during August 1962.

DESCRIPTORS: *Flames, *Diboranes, *Hydrazines, *Combustion, Combustion chambers, Jet mixing flow, Jet flames, Jet engine fuels, Thermodynamics, Thermochemistry, Physical properties, Measurement.

Some features of the diborane-hydrazine flame are now understood. The flame forms adducts that polymerize and dehydrogenate into solids. At least for diborane rich flames hydrogen is the only gaseous product as predicted by thermodynamic considerations. The formation of solid BN is not complete as not all hydrogen is released and BN formation does not proceed into a well ordered graphitic structure, although on a molecular basis B-N bonds are present as evidenced by infrared absorption. (Author)

AD-282 776 Div. 10
(TISTM/MS) OTS price $2.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
DIELECTROPHORETIC PROPELLANT ORIENTATION IN ZERO GRAVITY,
by J. B. Blackmon. 1962, 29p. incl. illus. table, 5 refs.
Unclassified report

DESCRIPTORS: *Liquid rocket propellants, *Electrophoresis, Control, Configuration, Control systems, Mathematical analysis, Electrodes, Test methods, Theory, Weightlessness, Propellant tanks.

A plausible method of orienting liquid propellants in zero gravity is presented which utilizes the dielectrophoretic force induced on electrically neutral bodies in a non-uniform electric field. One of the most significant problems of propellant orientation in zero gravity is that, prior to an engine restart in space, sufficient propellant must be properly oriented for a constant flow to the engine during the restart transient. A dielectrophoretic orientation system shows promise of solving this problem. Moreover, the system has low weight and energy requirements when compared to the other methods of zero gravity propellant orientation. Experiments were performed in which equi-density, immiscible fluids are used in experimental models to simulate conditions in a propellant tank in zero gravity. Various electrode configurations are used to collect the fluid simulating the propellant. The resulting collection times verify the theoretical calculations based on electrostatic field theory. The possible applications of an orientation system using electric fields are discussed. (Author)

AD-282 837 Div. 10
(TISTM/MS) OTS price $2.50

Armstrong Cork Co., Lancaster, Pa.
CHEMICAL STRESS RELAXATION MEASUREMENTS OF POLYURETHANES.
Final rept. for Jan 60-Jan 61,
by S. J. Chlystak, E. A. Peterson and others.
May 62, 104p. incl. illus. tables, 89 refs.
(Contract AF 33(616)7088, Proj. 7360)
(WADD TR 61-71) Unclassified report

circular cylinder bonded at the outer periphery to a rigid motor case. The ends of the grain were treated for both bonded and free conditions. The analysis was limited to materials which are homogeneous, isotropic, elastic, and undergo small deformations. Results were obtained in dimensionless form which can be expressed in terms of only three independent variables - Poisson's ratio and the length-to-diameter and the inner-to-outer diameter ratios of the grain. The effect of these variables on the stress, strain, and displacement distributions in the propellant grain was examined. The Raleigh-Ritz method was employed in conjunction with the principle of minimum potential energy to obtain expressions for the displacements in a propellant grain in the form of a hollow, right circular cylinder bonded at the outer periphery to a rigid motor case and subjected to cure shrinkage. (Author)

AD-282 113 Div. 10, 27
(TISTA/SEB) OTS price $1.60

Solid Propellant Information Agency, Applied Physics Lab., (JHU), Silver Spring, Md.
COMBUSTION INSTABILITY OF SOLID ROCKET PROPELLANTS AND MOTORS,
by W. G. Berl. July 62, 12p. refs. (Review paper no. 2)
(Contract NOw 62-0604-c)
Unclassified report

DESCRIPTORS: *Combustion, *Solid rocket propellants, Rocket motors, Theory, Oscillations, Chemical analysis, Physical properties, Research program administration, Stability.

This paper summarizes the highlights of the status of engine problems, the physical and chemical principles of combustion and the nature of the R&D organization working on combustion problems in the U.S. (Author)

AD-282 114 Div. 10
(TISTM/MS) OTS price $1.60

Solid Propellant Information Agency, Applied Physics Lab. (JHU), Silver Spring, Md.
A REVIEW OF THE STATE-OF-THE-ART ON SOLID PROPELLANT MECHANICAL PROPERTIES IN THE UNITED STATES,
by D. A. Hart. July 62, 14p. 8 refs. (Review paper no. 3)
(Contract NOw 62-0604-c)
Unclassified report

DESCRIPTORS: *Solid rocket propellants, Propellant grains, Failure (Mechanics), Scientific research, Mechanical properties.

AD-282 332 Div. 10
(TISTM/EJH) OTS price $3.60

Phillips Petroleum Co., Bartlesville, Okla.
SPECIFICATION OF JET FUEL HYDROGEN CONTENT FOR CONTROL OF COMBUSTION CLEANLINESS.
Progress rept. no. 1, Apr-May 62,
by R. M. Schirmer. June 62, 35p. incl. illus. tables (Research Div. rept. 3195-62R)
(Contract N600(19)-58219)
Unclassified report

DESCRIPTORS: *Jet engine fuels, *Hydrocarbons, Test methods, Hydrogen, Molecular structure, Combustion, Control, Flames, Aviation fuels.

A critical analysis was made of current test methods, Smoke Point and Luminometer Number, for evaluation of the burning quality of hydrocarbon fuels for aircraft gas turbine engines. Both are performance tests in which a sample of jet fuel is burned in a wick lamp to determine its relative soot forming tendency. Unfortunately, the laminar flow diffusion flame of the wick lamp differs appreciably from the highly turbulent combustion process in an aircraft gas turbine engine. Differences in the mechanism of soot formation, as evidenced by the effect of hydrocarbon structure, are discussed in detail. Measurements of the cleanliness of aircraft gas turbine combustion processes, liner temperature and flame radiation, show a linear correlation with hydrogen content of the fuel. The cleanest burning fuels are those that contain the most hydrogen. A two- to fourfold improvement in repeatability and a fourfold improvement in reproducibility over current test methods should be feasible with hydrogen content. The use of hydrogen content for specification of jet fuel burning quality is recommended. (Author)

AD-282 387 Div. 10
(TISTM/GEC) OTS price $4.60

Instituto Nacional de Tecnica Aeronautica (Spain).
ON THE STRUCTURE OF PREMIXED AND DIFFUSION LAMINAR SPHERICO-SYMMETRICAL FLAMES,
by P. Perez del Notario and C. Sanchez Tarifa. July 62, 22p. illus. 9 refs. (Technical note no. 1)
(Grant AF 62-90) Unclassified report

DESCRIPTORS: *Flames, Laminar boundary layer, Diffusion, Spheres, Combustion, Theory, Reaction kinetics, Hydrogen, Butanes, Air, Mathematical analysis, Fluid flow.

Premixed and diffusion laminar spherico-symmetrical flames were studied by means of a theoretical model in which chemical kinetics is approximated by means of an over-all reaction rate. Non-adiabatic cases are fully considered and the influence of the main parameters of the process are thoroughly studied. Results of an experimental investigation on diffusion flames are also included. They have been obtained by burning in air hydrogen and butane injected through different sized porous ceramic spheres. A comparison between theoretical and experimental results is also included. (Author)

AD-282 439 Div. 10
(TISTA/GEC) OTS price $7.60

United Technology Corp., Sunnyvale, Calif.
DEVELOPMENT OF NONDESTRUCTIVE TESTING TECHNIQUES FOR LARGE SOLID-PROPELLANT ROCKET MOTORS.
Technical note no. 1, 1 Mar-30 June 62,
by R. Citerley, S. A. Murch and D. Baker.
1 Aug 62, 72p. incl. illus. tables, 26 refs.
(Rept. no. UTC 2015-TN-1)
(Contract AF 04(611)8018)
Unclassified report

DESCRIPTORS: *Non-destructive testing, *Propellant grains, Solid rocket propellants, Pressure, Combustion, Combustion chambers, Elasticity, Stresses, Temperature, Load distribution, Fracture (Mechanics), Heating, Rocket cases, Mathematical analysis, Analysis, Shear stresses, Surface area, Viscosity, Rocket motors, Propellant properties, Photoelasticity.

Contents:
Relationship of chamber pressure to excess burning area
Stress analysis of the propellant grain
Defect analysis
Determination of the pressure distribution in a propellant grain crack

SAND MOBILITY RESULTS,
by C. W. Wilson and C. J. Nuttall, Jr. June 62, 77p. incl. illus. tables, 15 refs.
(Contract DA 44-177-tc-737)
(TCREC TR 62-65)
Unclassified report

DESCRIPTORS: *Tires, *Vehicles, Sand, Soils, Terrain, Snow, Snow roads, Snow vehicles, Desert tests.

Data concerning the sand performance of a series of tires tested on a single tire test rig at Rock Hall, Md. in 1955, is correlated with 4x4 performance data on a wide variety of scale-model and full-size tires and vehicles developed during TRECOM's Scaled Vehicle Mobility Factors program in sand, conducted at Fort Story, Va., 1956 to 1960. (Author)

AD-282 626 Div. 11
(TISTE/CDM) OTS price $3.60

Army Transportation Board, Fort Eustis, Va.
CARRIER, CARGO, AMPHIBIOUS, M116 (HUSKY) PHASE I: TROPICAL EVALUATION.
Final rept. on Phase 1.
July 62, 27p. incl. illus. (Rept. no. TCB-61-111-OE)
Unclassified report

DESCRIPTORS: *Amphibious vehicles, *Tracked vehicles, *Cargo vehicles, *Passenger vehicles, Tropical regions, Jungles, Maneuverability, Tests.

An evaluation was made of the M116 cargo carrier in conjunction with Operation Swamp Fox I in an environmental expedition through the jungle of the Republic of Panama. The vehicle is a low ground pressure cargo and personnel carrier capable of operating over all kinds of terrain and under all seasonal conditions in tropical, temperate and arctic zones. Propulsion and steering, both on land and water, are accomplished by movements of the tracks. Over-all performance of the vehicle was excellent. It completed the expedition in operable condition. Only occasional assistance was required when major obstacles were encountered such as steep, slippery banks or ravines. The vehicle displayed adequate power and excellent maneuverability for loaded and towing conditions. Vehicle maintenance was relatively light. Approximately 144 miles of jungle terrain were traversed in 22 operating days. Depending on surface conditions, slopes to 60% were climbed. (Author)

AD-282 940 Div. 11
(TISTW/EET) OTS price $4.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
SNOW-COMPACTION EQUIPMENT SPRAYERS AND DUSTERS.
Final rept.,
by E. H. Moser, Jr. and S. E. Gifford. 27 July 62, 36p. incl. illus. 15 refs. (Technical rept. no. R-111)
(Proj. Y-F015-11-077) Unclassified report

DESCRIPTORS: *Snow, *Snow roads,, Processing, Hardness, Water, Spray tanks, Additives, Arctic regions, Effectiveness, Design, Tests, Test methods, Naval equipment, Deterioration, Insulating materials.

Experiments were made to determine the feasibility of adding free water to compacted snow to improve its hardness, and tests were made to determine the effectiveness of sawdust as an insulator to prevent deterioration. A sprayer was developed for adding free water at a controlled rate, and a spreader was developed for applying the sawdust.

AD-283 003 Div. 11, 33
(TISTW/JRG) OTS price $1.10

Aerospace Information Div., Washington, D. C.
ADJUSTABLE-GAGE RAILROAD AXLE UNIT,
by R. Tackert and A. Grevesmuhl. 21 Aug 62, 2p. incl. illus. (AID rept. no. 62-118)
Unclassified report

DESCRIPTORS: *Railroad cars, *Railroad tracks, Germany, USSR, Axle shafts.

A description is given of an adjustable-gage railroad axle unit designed to compensate for the difference between Soviet and East German rail gages, 1524 mm and 1435 mm, respectively. The device involves: (1) an axially-sliding wheel bearing; (2) locking of the wheels in the proper positions; (3) a switching device not affected by the weight of the railroad car; (4) a dog-driver coupling between wheel and axle; and (5) a seal to keep dirt or snow from entering the locking device and wheel bearing.

## 12. GUIDED MISSILES

AD-281 737 Div. 12, 6
(TISTW/DLW) OTS price $18.50

General Dynamics/Astronautics, San Diego, Calif.
PRECISE LONG RANGE RADAR DISTANCE MEASURING TECHNIQUES (PHASE II),
by B. A. Beach, D. L. Anderson and others.
1 July 62, 292p. incl. illus. tables, 31 refs.
(Rept. no. AE62-0484)
(Contract AF 30(602)2196, Proj. 5703)
(RADC TDR 62-252) Unclassified report

DESCRIPTORS: *Radar tracking, *Spaceships, *Space navigation, *Satellite vehicles, *Radar navigation, Costs, Ground support equipment, Satellite vehicle trajectories, Space flight, Instrumentation, Effectiveness, Data processing systems, Design, Lunar probes, Range finding, Position finding, Guidance.

An evaluation and comparative analysis of several basic tracking techniques were recently conducted. The evaluation considered the use of various tracking systems in tracking and guiding satellite and lunar spacecraft in terms of: (1) tracking accuracy required; (2) feasibility of establishing a configuration to meet accuracy requirements; (3) operational, functional, and physical attributes of such a tracking configuration, and (4) cost to produce the tracking system. The configurations of interest are: (1) a single antenna tracker with a precision pedestal for angle measurements; (2) a tracker with baseline antennas for angle and angular rate measurements; and (3) multiple installations of single antenna trackers integrated into a range-only system. The tracking techniques of interest are: (1) range measurement by pulse; (2) range measurement by cw; (3) angle measurement by precision pedestal; (4) angle measurement by interferometer baseline; and (5) position measurement by multiple ranging. A large-scale digital computer was programmed to simulate tracking of the missions with the configurations mentioned. The earth-based tracking system selected PROCTOR, a Precise Range Only Cislunar Tracking and Orbit Reduction System. (Author)

AD-281 757 Div. 12
(TISTA/WAW) OTS price $5.60

Naval Weapons Lab., Dahlgren, Va.
DETERMINATION OF A SATELLITE ORBIT ABOUT THE

DESCRIPTORS: *Solid rocket propellants, Propellant properties, Urethanes, Elastomers, Polymers, Stresses, Thermal stresses, Stability, Shear stresses, Measurement, Physical properties, Mechanical properties.

Three cast solid polyurethane elastomers, designated AF-1, AF-2, and AF-3, constituted with different numbers and kinds of cross-links were prepared from precisely characterized prepolymers and cross-linking processes. Both continuous and discontinuous stress relaxation measurements on standard 1/4 in. tensile specimens at temperatures of 100 C., 125 C., and 150 C. were made. The rates of scission of these three different kinds of cross-linked polyurethanes were measured and the activation energies, assuming normal Maxwellian decay for these processes, was determined. These correlate qualitatively with the different polymer structures investigated. Preliminary high-speed stress-strain analysis of these polymers was performed to observe their behavior at shock loading conditions. An unusual inversion of the relative ranking of the modulus as a function of testing rate and total strain was observed. Block specimens of these polyurethane polymers were prepared and conditioned at the stress relaxation conditions. (Author)

AD-282 969 Div. 10, 27
(TISTA/GEC) OTS price $9.10

Polytechnic Inst. of Brooklyn, N. Y.
COMBUSTION STABILITY: SHOCK WAVE PROPAGATION IN A LIQUID PROPELLANT ROCKET MOTOR,
by W. Chinitz and V. D. Agosta. June 62, 94p. incl. illus. tables, 49 refs. (PRL rept. no. 62-13)
(Contract AF 49(638)165, Proj. 9751)
Unclassified report

DESCRIPTORS: *Rocket motors, *Combustion, Shock waves, Drops, Combustion chamber gases, Aerodynamics, Drag, Dissociation, Heating, Heat, Mathematical analysis, Detonation waves, Controlled atmospheres, Oxidizers, Theory, Fuel sprays, Wave transmission, Liquid rocket propellants, Stability.

A model is presented for longitudinal shock wave propagation in liquid propellant rocket engines. The equations are written for the gas subsystem with appropriate terms included in the conservation equations to account for the evaporation and subsequent combustion of liquid fuel drops. Drag terms are included to account for the friction which may exist between the gas and liquid fuel drops when the velocities of each subsystem are not equal. The possibility of droplet shattering due to the action of large aerodynamic forces is also included in the analysis. Finally, the effect of gaseous dissociation is included employing the assumption that chemical equilibrium exists in the gas at the stations of interest. This analysis indicates that mass and heat addition and drag effects will substantially affect the gas dynamic state downstream of a shock wave. Qualitatively, the addition of mass appears to be the predominating effect. The analysis is employed to examine the effects of shock waves on a system in which liquid drops are suspended in an oxidizing atmosphere. The analysis is also utilized to examine shock wave propagation in a liquid propellant rocket engine. (Author)

AD-282 970 Div. 10, 27
(TISTA/GEC) OTS price $11.00

Polytechnic Inst. of Brooklyn, N. Y.
COMBUSTION INSTABILITY: NON-LINEAR ANALYSIS OF WAVE PROPAGATION IN A LIQUID PROPELLANT ROCKET MOTOR,
by Samuel Z. Burstein and Vito D. Agosta. Mar 62, 134p. incl. illus. 43 refs. (PRL rept. no. 62-15)
(Contract AF 49(638)165, Proj. 9751)
(AFOSR-2614) Unclassified report

DESCRIPTORS: *Rocket motors, *Combustion, Shock waves, Mathematical analysis, Drops, Pressure, Theory, Fuel sprays, Combustion chamber gases, Aerodynamics, Test methods, Tests, High frequency, Liquid rocket propellants, Stability.

A simplified model for the combustion of a bipropellant spray, with droplet break up, in the steady and non-steady state, in a liquid propellant rocket motor, is presented. Only the longitudinal modes of non-linear high frequency combustion instability are considered, and the method of obtaining a priori prediction of the stability or shocking limits of these pressure waves in a given rocket configuration is shown. In addition, a new technique for obtaining the composition of a complex chemical system in equilibrium is used. The longitudinal modes of non-linear high frequency combustion instability in liquid propellant rocket motors are studied theoretically by maintaining the non-linearity of the differential equations. (Author)

AD-282 998 Div. 10, 20, 4
(TISTM/EJH) OTS price $13.00

Aerojet-General Nucleonics, San Ramon, Calif.
HYDRAZINE PROCESS DEVELOPMENT.
Interim technical engineering rept. no. 5, May-July 62,
by R. L. Pearson, F. R. Standerfer and others.
July 62, 173p. incl. illus. tables, 11 refs.
(Rept. no. AN-676)
(Contract AF 33(600)42996)
(ASD TR 7-840A, vol. 6)
Unclassified report

DESCRIPTORS: *Hydrazines, *Liquid rocket propellants, Industrial production, Industrial equipment, Homogeneous reactors, Production reactors, Atomic energy engineering, Fission products, Chemical reactions, Chemical analysis, Chromatographic analysis, Ammonia, Uranium compounds, Amines, Fluorides, Synthesis, Separation, Particles, Measurement, Production.

A gas disengager, evaporator, materials test loop, and slurry capsule tests are described. The use of evaporation, distillation, and molecular sieves as $N_2H_4$-$NH_3$ separation techniques is described. Design of support systems for the in-reactor loop is presented. The fissio-chemical production of $UF_3$ is reported. Gas disengager test results show that a unit small enough to fit into the in-reactor loop will function well. Evaporative and molecular sieve separation experiments began; a distillation column was designed to concentrate the in-reactor loop product stream. $N_2H_4$ was separated from a crude, radioactive product with a fission fragment decontamination factor of about 100,000. Materials test loop operations showed that slurry-free, $NH_3$-$N_2H_4$ solutions were stable for up to 180 hours. The MSA Whitby and electron microscopy methods of particle size analysis were modified. A two-column, gas chromatograph was developed for analyzing H and N in the presence of $NH_3$ vapor. (Author)

## 11. GROUND TRANSPORTATION EQUIPMENT

AD-282 118 Div. 11
(TISTW/RD) OTS price $8.10

Wilson, Nuttall, Raimond Engineers, Inc., Chestertown, Md.
CORRELATION OF SINGLE TIRE TEST RESULTS WITH TC

unit (component, equipment or subsystem) reliability requirements based on such factors as feasibility of the over-all system requirement, unit/system failure relationships, unit or functional capability, relative unit state-of-the-art, duty cycles, and gross unit environment. The input data required by the model together with means for determining compliance to the allocated requirements through reliability or life tests are also discussed. (Author)

AD-282 413 Div. 12
(TISTP/TL) OTS price $10.10

Institute of Science and Tech., U. of Michigan, Ann Arbor.
AN ANALYTICAL DETERMINATION OF THE EXISTENCE OF OPTIMUM POINTS IN A CLASS OF NETWORKS.
Rept. on Proj. Michigan,
by Martin Golinsky. Aug 62, 116p. incl. illus. tables, 23 refs. (Rept. no. 2900-351-T)
(Contract DA 36-039-sc-78801)
Unclassified report

DESCRIPTORS: *Control systems, *Electrical networks, *Feedback, *Doppler navigation, *Inertial navigation, *Equations, *Errors, Tests, Design, Differential equations, Taylor's series, Polynomials, Statistical processes, Gyroscopes, Inertial guidance, Automatic.

The development of a technique for determining whether there exists, in a certain class of networks, an operating point which minimizes a particular index of performance is discussed. The index which is selected is the rms error, but it is shown that the tests are applicable to a wider class of indexes. The class of networks chosen for consideration may be described by linear constant-coefficient differential equations with inputs that are deterministic or member functions of a stationary random process. The class thus includes closed-loop feedback systems as well as passive networks. (Author)

AD-282 466 Div. 12
(TISTA/GEC) OTS price $4.60

North American Aviation, Inc., Downey, Calif.
ENERGY MANAGEMENT. A PARTIALLY ANNOTATED BIBLIOGRAPHY.
26 Mar 62, 39p. (Rept. no. SID 62-351)
Unclassified report

DESCRIPTORS: *Energy, *Bibliography, *Re-entry vehicles, *Automatic pilots, Hypervelocity vehicles, Re-entry aerodynamics, Rocket propulsion, Flight paths, Satellite vehicle trajectories, Management engineering, Control systems.

A survey of the literature, mainly since 1957, on Energy Management, the use of propulsive and aerodynamic forces to control the flight path of satellites and space vehicles during re-entry is given. (Author)

AD-282 470 Div. 12
(TISTB/AW) OTS price $4.60

North American Aviation, Inc., Downey, Calif.
PROJECT APOLLO, PRE-CONTRACTURAL DOCUMENTATION AND ORBITAL RENDEZVOUS: A LITERATURE SURVEY.
29 Dec 61, 38p. (Rept. no. SID 61-470)
Unclassified report

DESCRIPTORS: *Bibliography, *Satellite rendezvous vehicles, *Space navigation, Spaceships, Manned, Extraterrestrial bases, Satellite vehicles, Refueling in flight, Moon, Landing, Parachutes, Landing impact, Aerodynamics, Food, Research program administration, Instrumentation, Tracking, Guidance, Communication systems, Breathing apparatus, Sanitary engineering, Booster rockets.

A review of literature on Project Apollo and Orbital Rendezvous, in two parts, from August 1959 to December 4, 1961 is given. The references are listed alphabetically by corporate author and periodical title in one alphabet. Following the bibliography are both author and subject indexes. (Author)

AD-282 472 Div. 12
(TISTB/AW) OTS price $6.60

North American Aviation, Inc., Downey, Calif.
SPACE RENDEZVOUS: TECHNICAL DOCUMENTATION.
9 May 62, 56p. (Rept. no. SID 62-559)
Unclassified report

DESCRIPTORS: *Bibliography, *Space navigation, *Satellite rendezvous vehicles, Spaceships, Booster rockets, Refueling in flight, Guidance, Control, Extraterrestrial bases, Satellite vehicles.

This bibliography covers recent technical literature on Space Navigation with special reference to the technique of rendezvous and orbital transfer. The references are listed alphabetically by corporate author and periodical title in one alphabet. Author and subject indexes are included. (Author)

AD-282 477 Div. 12
(TISTA/GEC) OTS price $3.60

North American Aviation, Inc., Downey, Calif.
LITERATURE SEARCH AND ANNOTATED BIBLIOGRAPHY ON THE DEVELOPMENT OF SELF-ADAPTIVE CONTROL SYSTEMS FOR LARGE BOOSTER VEHICLES.
1 May 61, 30p. (Rept. no. SID 61-85)
Unclassified report

DESCRIPTORS: *Control systems, *Bibliography, *Automatic pilots, Booster rockets, Liquid rocket propellants, Stabilization systems, Rocket cases, Deformation, Stresses, Guidance, Servo systems.

A survey is given of the literature on the following: control system error and instability in large booster vehicles due to body-bending and propellant sloshing, and the development of the self-adaptive control system to prevent resultant instability. (Author)

AD-282 478 Div. 12
(TISTA/GEC) OTS price $6.60

Naval Ordnance Test Station, China Lake, Calif.
EXPERIMENTAL STUDY OF AN OPTICAL CONTROL SYSTEM FOR ACHIEVING A SOFT PLANETARY LANDING,
by C. E. Hendrix. July 62, 60p. incl. illus. 8 refs. (NOTS TP 2883)
(NAVWEPS rept. no. 7890)
Unclassified report

DESCRIPTORS: *Control systems, *Optical systems, *Landing, Planets, Design, Tests, Flight testing, Mathematical analysis, Theory, Specific impulse, Thrust, Rocket propulsion, Spaceships, Space probes, Lunar probes, Exhaust flames, Interference, Optical equipment, Moon, Space flight.

An optical control system, designed, built, and feasibility tested for soft planetary landing of a rocket vehicle, is described. The system is

OBLATE EARTH FROM TWO POSITIONS,
by Claus Oesterwinter. 31 May 62, 41p. incl. illus. tables, 2 refs. (NWL rept. no. 1771)
Unclassified report

DESCRIPTORS: *Satellite vehicle trajectories, *Orbital flight paths, Satellite vehicles, Digital computers, Programming, Differential equations, Partial differential equations, Integral equations, Mathematical analysis.

A discrete set of possible orbits for an artificial earth satellite can be computed when only its absolute positions in space are known at two times. The approach employed in the present method is to scan systematically all possible values of the number of revolutions and of the semi-latus rectum and eventually to compare the observed time interval of the above two times with computed values for this time difference; a possible solution is obtained when these two quantities become identical. With the aid of additional observational material it is then a simple matter to search for the true orbit among the set of possible solutions. The calculations take into account first-order secular perturbations due to the oblateness of the earth. In its present form, the method demands the use of a high-speed digital computer. (Author)

AD-282 041 Div. 12, 2
(TISTA/SEB) OTS price $5.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
PROGRAMMED SATELLITE PASS CALCULATIONS,
by A. A. Mathiasen. 28 June 62, 56p. (Rept. no. 21G-1)
(Contract AF 19(604)7400)
(AFESD TDR 62-108) Unclassified report

DESCRIPTORS: *Orbital flight paths, Satellite vehicles, Programming, Computers, Mathematical prediction.

With a set of orbital elements as input, a program (KB02) computes the limits of a pass for a given site. The time and azimuth at which the satellite rises, the time and azimuth at which it sets, the azimuth, elevation, and range of the midpoint, and the orbital elements valid for the midpoint are computed. This program was written in support of the Lincoln Laboratory West Ford effort, but it has general application to various satellite-handling problems. (Author)

AD-282 057 Div. 12
(TISTB/MS) OTS price $2.00

Space Technology Labs., Inc., Redondo Beach, Calif.
TECHNIQUES FOR ANALYSIS OF NONLINEAR ATTITUDE CONTROL SYSTEMS FOR SPACE VEHICLES. VOLUME IV. REFERENCES AND BIBLIOGRAPHY.
Final rept.,
by E. I. Ergin, V. D. Norum and T. G. Windeknecht. June 62, 68p. refs.
(Contract AF 33(616)7811, Proj. 8219)
(ASD TDR 62-208, vol. 4)
Unclassified report

DESCRIPTORS: *Spaceships, *Bibliography, *Satellite vehicle research, *Satellite vehicles, *Nonlinear systems, Control systems, Control, Analysis.

This four volume report was prepared in order to compile, describe, and apply available nonlinear analysis and design techniques for space vehicle attitude control systems and to outline additional areas of future effort to improve present analysis and design procedures. Each of the four volumes is relatively independent of the others. Volume I is a definition and description of the problems associated with the design of the space vehicle attitude control systems. Volume II treats in detail the principal techniques for the analysis of nonlinear control systems and shows the application of these techniques to specific attitude control system problems. Volume III discusses three general problems in space vehicle attitude control systems, (1) single axis on-off gas jet system design, (2) active attitude control system design for a spin-stabilized vehicle, and (3) the design of a control system for a satellite vehicle with reaction wheels and gas jets. Volume IV is a collection of references and bibliography with annotations and comments covering the spectrum of the study effort. (Author)

AD-282 229 Div. 12, 7
(TISTA/GEC) OTS price $13.50

Sundstrand Aviation-Denver, Denver, Colo.
ANALYSIS AND FEASIBILITY STUDY OF THERMAL ENERGY STORAGE DEVICES FOR SPACE VEHICLE APPLICATION.
Interim summary rept.,
by John R. May and Robert R. Conrad. Jan 61, 176p. incl. illus. tables, 5 refs. (Rept. no. CDRD-61:2004)
(Contract AF 33(616)6997)
(WADD TR 61-118) Unclassified report

DESCRIPTORS: *Power supplies, Theory, Thermodynamics, Thermal conductivity, Thermal radiation, Heat transfer, Specific heat, Design, Feasibility studies, Heat exchangers, Fluid mechanics, Fluids, Rubidium, Potassium, Mercury, Helium, Aluminum compounds, Bromides, Tests, Heat, Storage, Energy, Heat engines, Space flight.

Feasibility and design studies were made of energy storage for subsequent utilization by space vehicle power plants including storage at heat source, regenerator, and heat sink or radiator storage devices. The experimental phase was concerned with material compatibility tests. Analytical work was aimed at the determination of the optimum heat storage material for a given mission profile. Primary emphasis was placed on weight considerations for the storage level at some given temperature level. Two modes of storage were considered, latent and sensible. Only solid and liquid phases and the transition between them were considered. A discussion is included of several engines, cycles, and their working fluids and the factors arising therefrom which influence storage material selection. (Author)

AD-282 271 Div. 12, 8
(TISTW/RD) OTS price $3.00

ARINC Research Corp., Washington, D. C.
THE ALLOCATION OF SYSTEM RELIABILITY. VOLUME I. DEVELOPMENT OF PROCEDURES FOR RELIABILITY ALLOCATION AND TESTING.
Final rept., 1 July 60-30 Nov 61,
by Harold S. Balaban and Hal R. Jeffers. June 62, 178p. incl. illus. tables (Pub. no. 152-2-274, vol. 1)
(Contract AF 33(616)7468, Proj. 4156)
(ASD TDR 62-20, vol. 1) Unclassified report

DESCRIPTORS: *Reliability, Tests, Flight testing, Weapons, Air force equipment, Electronic equipment, Failure (Mechanics), Sampling, Statistical analysis, Mathematical prediction.

Methods for allocating a system reliability requirement to subsystem and lower levels were investigated for four basic system types; serial, modified-serial, redundant and bimodal. An allocation model is presented for determining

DESCRIPTORS: *Spaceships, *Satellite vehicles, Spin, Velocity, Solar cells, Solar energy, Torque, Control, Design, Sattelite vehicle trajectories, Orbital flight paths, Stability, Control systems.

Contents:
The rate diagram technique in analysis and design of space vehicle on-off attitude control systems
A simple system for sun orientation of a spinning satellite
Design considerations of inertia wheel systems for attitude control of satellite vehicles

AD-282 734 Div. 12
(TISTA/GEC) OTS price $4.60

Aeronutronic, Newport Beach, Calif.
THE PREDICTION OF HEAT TRANSFER AND ABLATION IN THE AFT-CLOSURE OF A SOLID PROPELLANT ROCKET MOTOR,
by W. C. Kuby, Jr. and J. L. Richardson. 1962, 1v. incl. illus. table, 45 refs.
(Contract AF 04(611)7047)
Unclassified report

DESCRIPTORS: *Rocket motors, *Combustion chamber liners, *Thermal insulation, Mathematical prediction, Heat transfer, Ablation, Military requirements, Specifications, Mathematical analysis, Elastomers, Thermal radiation, Thermodynamics, Rocket closure cups, Solid rocket propellants, Design.

A mathematical design model has been developed for the prediction of insulation requirements in the aft-closure of a solid propellant rocket motor. This model and the associated calculation technique represent only a first approximation to the exact solution of a problem concerned with various complex phenomena. The behavior of ablative elastomeric insulation materials in such an application is considered. The choice of the assumptions used to calculate the forced convective and radiative heat fluxes is based on recent experimental results. A summary is made of the information still to be determined in order that this model can be fully utilized. (Author)

AD-282 775 Div. 12
(TISTW/PCR) OTS price $2.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
SATELLITE INERTIA-WHEEL ATTITUDE CONTROL ON ELLIPTICAL ORBITS,
by M. J. Abzug. Aug 62, 25p. incl. illus. tables, 6 refs. (Engineering paper no. 1384)
Unclassified report

Presented to 1962 Symposium on Ballistic Missile and Space Technology, Colorado Springs.

DESCRIPTORS: *Satellite attitude, *Control systems, Satellite vehicle trajectories, Perturbation theory, Mathematical analysis, Equations, Stability, Non-linear differential equations, Motion, Satellite vehicles.

An investigation is made of the attitude-control characteristics of a satellite on an elliptical orbit when the attitude-control system consists of three inertia wheels in a closed-loop arrangement. A two-part perturbation analysis of the system is made. First, a reference-motion solution is obtained. This is a particular solution of the nonlinear equations of motion in which body axes coincide with reference axes. Then, perturbations from the reference motion are analyzed. The reference-motion solution is used to minimize the peak inertia-wheel speeds incurred in following nonuniformly rotating reference axes on an elliptical orbit. An undamped oscillation of very long period that varies with position on orbit is found in the perturbation analysis. The existence of this oscillation is verified in the solution of the complete equations of motion by numerical analysis. A comparison of the numerical results with perturbation theory predictions shows that the motions following realistic injection errors are very little affected by nonlinearities in the equations of motion and coordinate transformations. (Author)

AD-282 805 Div. 12, 15
(TISTA/VGW) OTS price $5.00

Space Technology Labs., Inc., Redondo Beach, Calif.
TECHNIQUES FOR ANALYSIS OF NONLINEAR ATTITUDE CONTROL SYSTEMS FOR SPACE VEHICLES. VOLUME II. TECHNIQUES FOR ANALYSIS AND SYNTHESIS OF NONLINEAR CONTROL SYSTEMS.
Final rept.,
by E. I. Ergin, V. D. Norum, and T. G. Windeknecht. June 62, 302p. incl. illus. tables.
(Contract AF 33(616)7811, Proj. 8219)
(ASD TDR 62-208, vol. 2)
Unclassified report

DESCRIPTORS: *Satellite attitude, *Spaceships, Mathematical analysis, Nonlinear differential equations, Stability, Design, Control systems.

A four volume report was prepared in order to compile, describe, and apply the available nonlinear analysis and design techniques for space vehicle attitude control systems and to outline additional areas of future effort to improve present analysis and design procedures. Each of the four volumes is relatively independent of the others and treats a distinct phase of the study program. However, they are related within the scope of the over-all study effort. Volume II treats in detail the principal techniques for the analysis of nonlinear control systems and shows the application of these techniques to specific attitude control system problems. (Author)

AD-282 816 Div. 12, 13, 17
(TISTM/EJH) OTS price $4.60

Watertown Arsenal Research and Development Div., Mass.
A TEST TO DETERMINE THE RELIABILITY OF ANALYTICAL METHODS OF DESIGN OF ALUMINUM HONEYCOMB SANDWICH CYLINDERS IN THE EULER BUCKLING RANGE,
by Michael H. Matigian. June 62, 49p. incl. illus. 14 refs. (Technical rept. no. WARD TR 766.9/1)
(DA Proj. 517-01-002)
Unclassified report

DESCRIPTORS: *Sandwich construction, *Honeycomb cores, *Cylindrical bodies, *Aluminum alloys, *Rocket launchers, Reliability, Test methods, Design, Failure (Mechanics), Resin adhesives, Mechanical properties, Ground support equipment.

Although failure patterns have been determined, both analytically and experimentally, for sandwich cylinders in wall or cylinder buckling, as well as analytical determinations of Euler or column buckling of such cylinders, little has been done in experimental verification of sandwich cylinders in column buckling. Two long aluminum honeycomb sandwich cylinders were constructed and tested to destruction to determine their load-carrying, buckling and possible post-buckling responses. (Author)

AD-282 995 Div. 12, 9, 15
(TISTA/VGW) OTS price $1.00

Michigan U., Ann Arbor.
FLIGHT SIMULATION OF ORBITAL AND REENTRY VEHICLES.

characterized by simplicity of concept and mechanism. Results of both dynamic and static tests are presented, together with a discussion of the theoretical study of the total impulse requirements of such a system. (Author)

AD-282 491 Div. 12
(TISTA/GEC) OTS price $9.10

RAND Corp., Santa Monica, Calif.
THE SYNERGETIC PLANE CHANGE FOR ORBITING SPACECRAFT,
by F. S. Nyland. Aug 62, 104p. incl. illus. 4 refs. (Research memo. no. RM-3231-PR)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: *Satellite vehicle trajectories, *Orbital flight paths, Satellite vehicles, Space capsules, Hypervelocity vehicles, Mathematical analysis, Rocket propulsion, Aerodynamics, Superaerodynamics, Maneuverability.

An investigation of a synergetic maneuver was made, which uses a combination of rocket propulsion and aerodynamic forces to obtain plane changes for orbiting spacecraft. Each phase of the maneuver--deorbiting, pullout, glide, ascent, and injection--is analyzed by the use of approximate closed form solutions to the equations of motion, when these equations cannot be solved analytically. The synergetic maneuver and a method using only propulsive devices are then compared. (Author)

AD-282 513 Div. 12, 22, 7
(TISTE/CAM) OTS price $3.60

Amphenol-Borg Electronics Corp., Chicago, Ill.
DEVELOPMENT OF A TWO-CONDUCTOR SHIELDED CABLE CONNECTOR FOR USE IN MISSILE FIRING CIRCUITS.
Quarterly technical progress rept. no. 4, 28 Mar-28 June 62,
by William J. Mashek. 28 June 62, 12p. illus.
(Rept. no. 1-181)
(Contract N178-7933)
Unclassified report

DESCRIPTORS: *Electric connectors, *Electric cables, *Firing circuits, *Guided missile launchers, *Electromagnetic shielding, Design, Radiofrequency power, Electromagnetic waves, Hazards, Effectiveness, Test methods, Test equipment.

Effort continued to develop a two-conductor shielded cable connector for use in missile firing circuits. Evaluation testing of sample connectors relative to radiofrequency interference shielding effectiveness was completed. The receptical contacts in the connectors were isolated sufficiently to preclude the possibility of field personnel accidentally touching the contacts. The connector, due to its mechanical design, will be able to withstand environmental conditions without degrading the shielding effectiveness of the connector or the associated cable. An improved cable braid was developed. (Author)

AD-282 648 Div. 12, 15
(TISTW/EET) OTS price $3.60

Air Force Special Weapons Center, Kirtland Air Force Base, N. Mex.
PROBABILITY APPLICATIONS TO WEAPON SYSTEMS ANALYSIS,
by Joseph S. Toma. July 62, 37p. incl. illus. tables, 9 refs. (Rept. no. AFSWC TDR 62-59)
(Proj. 7812)
Unclassified report

DESCRIPTORS: *Weapons, Guided missiles, Guided missile warheads, Interception probabilities, Targets, Statistical distributions, Probability, Failure (Mechanics), Mathematical analysis, Analysis, Operation, Effectiveness, Costs, Reliability.

A study has been made of several useful applications of probability principles for weapon analysis problems. Included in the discussion is a summary of frequently used distribution functions, several aspects of single-shot kill probabilities, multiple-shot probabilities, point targets, area targets, lethal volumes, and system reliability. Reference data are provided in a form useful for weapon system analysis. (Author)

AD-282 705 Div. 12
(TISTW/RD) OTS $8.60

Space Technology Labs., Inc., Rodondo Beach, Calif.
TECHNIQUES FOR ANALYSIS OF NONLINEAR ATTITUDE CONTROL SYSTEMS FOR SPACE VEHICLES. VOLUME I. CHARACTERISTICS OF THE SPACECRAFT ATTITUDE CONTROL PROBLEM.
Final rept., Jan-Dec 61,
by E. I. Ergin, V. D. Norum, and T. G. Windeknecht. June 62, 90p. incl. illus. table.
(Contract AF 33(616)7811, Proj. 8219)
(ASD TDR 62-208, vol. 1) Unclassified report

DESCRIPTORS: *Spaceships, *Satellite vehicles, Satellite attitude, Nonlinear systems, Nonlinear differential equations, Orbital flight paths, Satellite vehicle trajectories, Equations, Motion, Matrix algebra, Transformations (Mathematics), Infrared scanning, Computer logic, Solar cells, Torque, Control, Control systems.

This four volume report was prepared in order to compile, describe and apply the available nonlinear analysis and design techniques for space vehicle attitude control systems and to outline additional areas of future effort to improve present analysis and design procedures. Each of the four volumes is relatively independent of the others. However, they are related within the scope of the over-all study effort. Volume I is a definition and description of the problems associated with the design of space vehicle attitude control systems. Volume II treats the principal techniques for the analysis of nonlinear control systems and shows the application of these techniques to specific problems. Volume III discusses three general problems in space vehicle attitude control systems, (1) single axis on-off gas jet system design, (2) active attitude control system design for a spin-stabilized vehicle, and (3) the design of a control system for a satellite vehicle with reaction wheels and gas jets. Volume IV is a collection of references and bibliography. (Author)

AD-282 706 Div. 12
(TISTW/RD) OTS price $2.00

Space Technology Labs., Inc., Redondo Beach, Calif.
TECHNIQUES FOR ANALYSIS OF NONLINEAR ATTITUDE CONTROL SYSTEMS FOR SPACE VEHICLES. VOLUME III. EXAMPLES OF ANALYTICAL DESIGN OF SPACECRAFT ATTITUDE CONTROL SYSTEMS.
Final rept.,
by E. I. Ergin, V. D. Norum, and T. G. Windeknecht. June 62, 70p. incl. illus.
(Contract AF 33(616)7811, Proj. 8219)
(ASD TDR 62-208, vol. 3) Unclassified report

steam or electricity, and discharged to snow or ice sump or marine outfall. For isolated areas and small groups of men, a recirculating synthetic flushing fluid unit would give adequate solution to the human waste problem with optimum water conservation. (Author)

AD-282 832 Div. 13
(TISTP/FR) OTS price $4.60

Bureau of Reclamation, Denver, Colo.
UTILIZATION OF SOIL-CEMENT AS SLOPE PROTECTION FOR EARTH DAMS,
by W. G. Holtz and F. C. Walker. 8 May 62, 29p. illus. 5 refs. (Soils engineering rept. no. EM-652)

Unclassified report

A paper prepared for presentation at the ASCE Water Resources Engineering Conference, Omaha, Nebraska.

DESCRIPTORS: *Cements, *Soils, *Levees, Dams, Nebraska, Colorado.

The high cost of riprap facings for earth dams has indicated a need for investigating other methods for slope protection. Properties of such facings may be divided into two parts: erosion resistance to wave action and climatic conditions, and properties which influence the performance of the structure protected. Starting with developments for soil-cement in highway construction, modifications were evaluated through a series of laboratory tests to establish a basic mix and construction procedure for an experimental test section. The test section location and design were selected to secure test conditions representative of the maximum likely to be encountered. The results of a 10-year performance test are evaluated and modifications in mix design, construction procedure, and structure design determined for application to a dam presently under construction. Suggestions for selecting soils, performing laboratory tests, evaluating test results, and modifying designs to make soil-cement facings applicable are given. (Author)

AD-282 933 Div. 13
(TISTW/EET) OTS price $1.25

Naval Civil Engineering Lab., Port Hueneme, Calif.
MULTIPURPOSE MOBILIZATION BUILDING.
Final rept.,
by J. J. Hromadik and R. A. Bliss. 25 June 62, 45p. incl. illus. tables. (Technical rept. no. R-196)
(Proj. Y-F015-13-001)

Unclassified report

DESCRIPTORS: *Prefabricated buildings, Buildings, Construction, Concrete, Plywood, Materials, Metals, Glass textiles, Plastic coatings, Polymers, Resins, Plastics, Foundations (Structures), Steel, Load distribution, Military personnel, Feasibility studies, Civil engineering, Roofs.

A multipurpose building of precast thin-shell concrete panels was erected to evaluate the feasibility of constructing such a building with military personnel and to study the techniques for erecting it. Two types of reusable molds, one of plastic-coated plywood and the other of structural plastic, each with metal side forms, were used for the casting of panels. A description of the building, molds, and metal side forms for the prefabrication of the panels, and the erection techniques employed are given. Suggestions and cautions for future construction of similar prefabricated panel buildings are also presented. (Author)

AD-282 934 Div. 13
(TISTW/EET) OTS price $2.00

Naval Civil Engineering Lab., Port Hueneme Calif.
DEADMAN ANCHORAGES IN SAND.
Final rept.,
by J. E. Smith. 12 July 62, 76p. incl. illus. tables (Technical rept. no. R-199)
(Proj. Y-F015-15-001)

Unclassified report

DESCRIPTORS: *Foundations (Structures), Reinforced concrete, Sand, Soils, Railroads, Test facilities, Load distribution, Equations, Mathematical analysis, Tests, Test methods, Design.

Various sizes of reinforced-concrete deadman anchorages were tested in sand to obtain information for improving or expanding design criteria. Deadman holding capacities and reaction patterns under applied loads were determined and an empirical equation was developed by which both the capacities and reaction patterns can be calculated.

AD-282 936 Div. 13
(TISTM/JRG) OTS price $.75

Naval Research Lab., Washington, D. C.
AN EVALUATION OF CERTAIN ASPECTS OF MULTIPURPOSE POWDER FIRE EXTINGUISHING AGENTS.
Interim rept.,
by R. R. Neill and R. L. Tuve. 16 July 62, 18p. incl. illus. tables, 10 refs. (NRL rept. no. 5799)

Unclassified report

DESCRIPTORS: *Fires, *Fire extinguishers, *Powders, Ammonium radicals, Phosphates, Sodium compounds, Potassium compounds, Carbonates, Wood, Tires, Foams, Combustion, Mobile, Model tests, Control.

Class A fires of the wooden crib type were modeled on a small scale and correlated with Underwriters' Laboratories tests of multipurpose dry-chemical fire extinguishing powders. Satisfactory agreement was obtained compared with water extinguishment on the same models. Woodfire extinguishment efficiency of two of the products closely approached that of water. Multipurpose powders applied with proper technique, are effective in the extinguishment of rubber-tire fires, but a solution of wetting agent in water shows measurable advantages in efficiency on this type of fire. Class B fires of the tank-confined gasoline fuel type using a piped dry chemical system are extinguished with equal amounts of both sodium bicarbonate type powders and multipurpose powders. Potassium bicarbonate dry chemical powders show a 30% weight efficiency superiority in the same tests. Low-temperature (-40 F) operation of the various candidate devices with their powders shows efficient discharge. Fully satisfactory extinguishment can be expected on Class A, Class B, or mixed-class fires at these temperatures provided there is no leakage of extinguisher pressure. Since Class C fires may be considered as mixed-class types, with the added hazard of possible energized electrical circuits, this class of fire was not modeled. (Author)

AD-282 946 Div. 13
(TISTW/EET) OTS price $11.50

Massachusetts Inst. of Tech., Cambridge.
EVALUATION OF TECHNIQUES FOR CONSTRUCTING MODEL

PART III. AERODYNAMICS INFORMATION REQUIRED FOR SIX DEGREES OF FREEDOM SIMULATION.
Rept. for June 60-Nov 61, on Training Equipment, Simulators, and Techniques for Air Force Systems, by H. Buming. Dec 61, 26p. incl. illus. 10 refs.
(Contract AF 33(616)5664, Proj. 6114)
(ASD TR 61-171, vol. 3) Unclassified report

DESCRIPTORS: *Satellite vehicles, *Re-entry vehicles, *Space flight, *Flight simulators, Aerodynamic data, Analog systems, Mathematical analysis, Pressure, Mach number, Reynolds number, Re-entry aerodynamics, Simulation.

A survey of the aerodynamic information required for a simulator for a glide reentry vehicle is presented. Various phases of the flight are considered: hypersonic reentry, hypersonic-supersonic glide, and supersonic-transonic-subsonic approach and landing. Accuracy requirements and origin of aerodynamic information are briefly discussed. Aerodynamic parameters are defined, and the dependence of aerodynamic coefficients on these parameters is outlined. Special emphasis is placed on a technique for generating functions of two or three independent variables and some sample calculations are presented. (Author)

# 13. INSTALLATIONS AND CONSTRUCTION

AD-281 709 Div. 13, 25
(TISTP/WH) OTS price $2.60

Army Cold Regions Research and Engineering Lab. Hanover, N. H.
COOLING OF AN UNDERSNOW CAMP,
by Yin-Chao Yen and James A. Bender. Feb 62, 17p. incl. illus. tables (Research rept. no. 95)
(DA Proj. 8-66-02-400)
Unclassified report

DESCRIPTORS: *Underground structures, *Nuclear power plants, *Cooling, *Snow, Arctic regions.

An investigation was conducted at Camp Century, Greenland, to study the feasibility of using air wells to cool undersnow structures in the arctic during the summer months. It was found that the air well is a practical and effective means of providing a -20C air supply at volumetric flow rates of 1200 to 1700 cu ft/min. The extent and rate of warming of the snow beneath the trench floor by heat exchange between the air and the snow foundation depends upon trench air temperature, fan capacity, fan arrangement, and casing length. For example, in a well cased to a depth of 17.5 ft and equipped with a 5 hp fan drawing in air at a rate of 1700 cu ft/min, the maximum warming was 12.5C during a 42-day period. Snow temperature differences of about 7C were found between similar trenches with and without a fan installation. The minimum permissible distance between two adjacent fans to eliminate overlap in warming up the snow foundation is approximately 80 ft. (Author)

AD-281 883 Div. 13, 11
(TISTW/RD) OTS price $8.10

Society of Automotive Engineers, Inc., New York.
SAE CIMTC SUBCOMMITTEE XV ON WINTERIZATION.
Progress rept. no. 4.
Aug 60, 90p. incl. tables.
Unclassified report

DESCRIPTORS: *Vehicles, *Arctic regions, Tractors, Diesel engines, Quality control, Fuel oil, Engine primers, Bulldozers, Starting, Tractor engines, Pistons, Piston rings, Cylinder liners, Heaters, Fuel hose, Fuel injection, Fuel injectors, Maintenance.

AD-281 946 Div. 13, 33
(TISTE/CDM) OTS price $4.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
SNOW COMPACTION - TECHNIQUES.
Final rept.,
by E. H. Moser, Jr. 29 June 62, 27p. incl. illus. tables, 20 refs. (Technical rept. no. 114)
(Proj. Y-F015-11-051)
Unclassified report

DESCRIPTORS: *Snow, *Snow roads, *Road building equipment, *Military engineering, *Runways, Landing fields, Arctic regions, Antarctic regions, Tests, Naval operations, Maintenance, Airports, Hardening.

Extensive experiments were conducted to develop techniques and equipment for the Navy's cold-processing snow-compaction procedures for producing load-bearing snow by mechanical acceleration of the natural metamorphic processes occurring in snow. Six techniques have been developed: precompaction preparations, compressive compaction, depth-processing, double depth-processing, surface-hardening, and layered compaction. All six techniques are used in the maintenance and repair of snow-compaction areas, with the choice of technique depending on the need. In addition to developing techniques and equipment for compacting snow to varying degrees of hardness, some investigations have been made on the protection of this snow from deterioration under intense solar radiation and prolonged periods of above-freezing temperatures. Experience has shown that a basic understanding of the techniques and snow-compaction equipment is required for the successful construction of skiways, runways, parking areas, and snow roads. (Author)

AD-282 520 Div. 13
(TISTB/CCH) OTS price $18.00

Clark and Groff Engineers, Salem, Oreg.
SANITARY WASTE DISPOSAL FOR NAVY CAMPS IN POLAR REGIONS.
Final rept., pt. 3.
May 62, 1v. incl. illus. tables, 95 refs.
(Contract NBy-32205)
Unclassified report

DESCRIPTORS: *Sewage, *Sanitary engineering, *Military facilities, Navy, Antarctic regions.

Methods presently used for the collection and disposal of sanitary wastes in Navy camps in polar ice and littoral regions are grossly inadequate for the comfort and well-being of the personnel. All possible waste collection, treatment and disposal concepts were enumerated and evaluated. It was concluded that the regeneration of potable water from the sanitary wastes would solve the water supply and waste disposal problems simultaneously and entirely within the encapsulated environment of the polar camp. The proposed system consists of minimum flush toilets, combination of all wastes, and regeneration by a high temperature oxidation (HTO) unit or by vacuum distillation with catalysis. In the event that water supply is not a problem, wastes can be collected as stated, disinfected by waste heat,

full or part time saltwater immersion for approximately five years. The effectiveness of the antifouling paints and the plastic subcoats is evaluated. (Author)

AD-281 866 Div. 14, 17
(TISTM/MS) OTS price $1.25

Material Labs., Puget Sound Naval Shipyard, Bremerton, Wash.
REINFORCED PLASTIC COATINGS FOR THE PROTECTION OF STEEL SURFACES.
Final rept.,
by M. E. Phelps. June 62, 39p. incl. tables.
(Rept. no. P-300-14)
Unclassified report

DESCRIPTORS: *Plastic coatings, *Antifouling coatings, Plastics, Metal plates, Steel, Surfaces, Corrosion, Deterioration, Sea water, Atmosphere, Effectiveness, Sea water.

Plastic covered mild steel panels coated with either boottop or topside paints have been exposed to either part time salt water immersion or atmospheric conditions for five years. The effectiveness of the paints and the underlying plastics is evaluated. (Author)

AD-281 921 Div. 14
(TISTM/GEC) OTS price $2.60

Forest Products Lab., Madison, Wis.
RELATIONSHIP BETWEEN THICKNESS AND MECHANICAL PROPERTIES OF SEVERAL GLASS-FABRIC-BASE PLASTIC LAMINATES,
by Kenneth E. Kimball. May 62, 11p. illus. tables, 8 refs. (Rept. no. 1885)
(Contract AF 33(616)61-06)
Unclassified report

DESCRIPTORS: *Laminates, *Phenolic resins, *Glass textiles, Reinforcing materials, Plastics, Tensile properties, Torque, Thickness, Tests, Test methods, Mechanical properties.

Nine laminates of various thicknesses, fabricated from CTL-91LD phenolic resin and reinforced with 181-A1100 glass fabric, were evaluated in tension, compression, and flexure. The laminates covered the thickness range of 0.017 to 1.453 in. Results indicate that strength in tension, elevated-temperature compression, and flexure reached a maximum or nearly maximum value for laminates at about 1/8-in. thickness; below 1/8 in., strength decreases gradually at first, and then abruptly with decreases in laminate thickness. A slight increase in tensile strength for thicknesses above 1/8 in. was noted, but decreases were found in the other tests. The normal compressive strength value was shown to be at a maximum between thicknesses of about 1/4 and 1/2 in. with gradual, then abrupt, decreases in strength noted as the thickness decreased. Gradual decreases in strength were also noted at the thickness of the laminate was increased above about 1/2 in. Mathematical expressions previously reported for calculating the relationships of mechanical properties to laminate thickness did not prove satisfactory in this analysis, except for tensile strength. (Author)

AD-282 006 Div. 14, 25
(TISTM/MS) OTS price $1.50

Carbon Research Lab., U. of Buffalo, N. Y.
INVESTIGATION OF ELASTIC AND THERMAL PROPERTIES OF CARBON-BASE-BODIES.
Final rept., Nov 60-Jan 62 on Refractory Inorganic Non-metallic Materials,
by S. Mrozowski, J. F. Andrew and others.
June 62, 45p. incl. illus. tables, 14 refs.
(Contract AF 33(616)7791, Proj. 7350)
(WADC TR 58-360, pt. 4) Unclassified report

DESCRIPTORS: *Carbon, *Graphite, Elasticity, Thermal stresses, Mechanical properties, Heat treatment, Test equipment, Measurement, Pyrometers, High temperature research, Tests methods, Thermodynamics, Thermal conductivity, Thermal diffusion, Physical properties.

In continuation of work on the elastic properties of carbons, families of curves of the dependence of Young's modulus on temperature and on the heat treatment were obtained for four basic types of carbons, using the shortly completed high temperature equipment. The decisive influence of filler type was estabished. Improvements in the associated electronics were introduced. The amplitude dependence of the internal friction and dynamic Young's modulus were, for the first time, investigated at room temperature for vibrations in the sonic range of frequencies for several types of carbons. Reproducibility has been achieved in measurements of thermal conductivity with the new high temperature test apparatus and families of curves of the dependence of the conductivity on temperature and on heat treatment obtained for soft carbon. A new technique of determining the heat conductivity of carbons without internal heat generation was successful up to 1800 C. Improved results were obtained with the transient state technique of determination of the heat diffusivity by using a new fast responding pyrometer and a new improved apparatus for the steady sinusoidal wave technique constructed. (Author)

AD-282 047 Div. 14
(TISTM/MS) OTS price $1.60

Raytheon Co., Waltham, Mass.
HIGH TEMPERATURE MATERIALS DEVELOPMENT.
Monthly progress rept. no. 31 for 15 Aug 62. 15 Aug 62, 8p. incl. illus. table (Rept. no. S-453)
(Contract NOrd-19135)
Unclassified report

DESCRIPTORS: *Refractory materials, *Carbides, *Graphite, *Zirconium alloys, *Heat resistant alloys, Production, Pyrolysis, Microstructure, Mechanical properties.

Further investigation is made to increase the thermal shock resistance of zirconium Pyrocarbide. Test bars of the Pyrocarbide with excess PYROGRAPHITE continue to show exceptional flexural strengths at room temperature to 1500 C. Since, at the compositions under study, the continuous phase is that of graphite, the thermal and elastic properties of this material are similar to graphite. Calculated thermal shock resistance shows a hundredfold improvement over the stoichiometric compound. Shock test bars of these coatings are being forwarded to the Atlantic Research Corporation for evaluation. (Author)

AD-282 124 Div. 14, 31, 30
(TISTM/WH) OTS price $3.60

Armour Research Foundation, Chicago, Ill.
AN INVESTIGATION OF THE MATERIAL PARAMETERS INFLUENCING CREEP AND FATIGUE LIFE OF FILAMENT WOUND LAMINATES.
Quarterly rept. no. 2, 26 Apr-26 July 62,
by J. W. Dally. Aug 62, 32p. incl. illus. tables (Rept. no. 6)
(Contract NObs-86461)
Unclassified report

STRUCTURAL ELEMENTS,
by Joseph Antebi, Harold D. Smith and others.
May 62, 155p. incl. illus. tables, 56 refs.
(Research rept. no. R62-15)
(Contract DA 49-146-XZ-025)
(DASA-1287) Unclassified report

DESCRIPTORS: *Structures, *Beams, Load distribution, Stresses, Shear stresses, Steel, Reinforced concrete, Failure (Mechanics), Model tests, Mathematical analysis, Test equipment, Test methods, Tests, Simulation, Wire, Blast.

Extensive tests on model structural elements simulating larger scale reinforced concrete shear walls and columns have been performed. These models were made of wire reinforced sand-cement mortar. Comparisons of the behavior and failure conditions of the model elements to the larger scale elements which had been tested both statically and dynamically were made. It is concluded that it is possible and relatively easy to fabricate such elements - by the wire reinforced-sand cement mortar technique and that these elements will behave in a similar manner to prototype structural elements over the complete range of behavior to failure. (Author)

AD-283 045 Div. 13
(TISTP/FR) OTS price $4.60

Bureau of Reclamation, Denver, Colo.
DETERMINATION OF EARTHWORK QUANTITIES FOR AQUEDUCT AND PIPE DISTRIBUTION SYSTEMS.
Report on Electronic Computer Program Description no. C-109A.
Oct 60, 42p. incl. illus.
Unclassified report

DESCRIPTORS: *Civil engineering, Pipes, Soils, Mathematical analysis, Digital computers, Programming.

AD-283 067 Div. 13, 29
(TISTB/SJR) OTS price $1.60

Truesdail Labs., Inc., Los Angeles, Calif.
OPTIMAL WATER STORAGE STUDY OF MULTIFUNCTIONAL WATER-COMMODE CONTAINERS.
Final rept. for 30 Apr-30 June 62 on Phase B, Part II: Human Waste Storage,
by C. Bradley Ward, Jr., I. Bandziulis, and C. L. Blohm. 30 June 62, 9p. incl. tables.
(Contract DA 19-129-qm-1990)
Unclassified report

DESCRIPTORS: *Metabolic products, *Odors, Storage, Urine, Control, Materials, Plastics, Disinfectants, Sanitary engineering.

Data are presented on the storability of human waste in fiber drum containers lined with three different plastic films and containing four different sanitizers, over a period of 14 days. Adequate odor control was achieved with all sanitizers, i.e. soda ash, cresylic acids, saponified phenols and sodium pentachlorophenate, although soda ash showed no bactericidal action. Cresylic acids appear to be the preferred sanitizer. Among the liners, vinyl showed poor integrity, polyethylene and polyethylene-cellophane laminate showed marginal integrity. All plastics showed chemical compatibility with the waste.

## 14. MATERIALS (NON-METALLIC)

AD-281 791 Div. 14, 17
(TISTM/TCG) OTS price $1.60

Watertown Arsenal Labs., Mass.
THE GEOMETRY EFFECT OF THE SHEAR LIP AND FRACTURE TOUGHNESS TRANSITION TEMPERATURE FOR BIMODAL FRACTURE,
by Joseph I. Bluhm. June 62, 15p. incl. illus. 12 refs. (Technical rept. no. WAL TR 834.2/7)
Unclassified report

DESCRIPTORS: *Materials, *Fracture (Mechanics), Transition temperature, Shear stresses, Stresses, Deformation, Tensile strength, Impact shock, Geometry, Effectiveness, Sheets, Thickness, Metals, Mechanical properties.

A bimodal fracture model described in an earlier paper is shown to lead to temperature transition behavior consistent with observed results. Specifically, the effect of temperature and sheet thickness on fracture toughness is examined quantitatively. Based upon the findings of this study, it appears feasible to correlate the various definitions of transition temperature in current popular use. Several illustrative examples of the application of the model are included. (Author)

AD-281 831 Div. 14, 4
(TISTM/REB) OTS price $10.50

Monsanto Research Corp., Everett, Mass.
RESEARCH ON HIGH TEMPERATURE ADDITIVES FOR LUBRICANTS.
Final rept. 15 Feb 61-15 Jan 62,
by John O. Smith, Glenn R. Wilson and others.
Feb 62, 124p. incl. illus. tables, 20 refs.
(Contract AF 33(616)7853, Proj. 3044)
(WADC TR 59-191, pt. 4) Unclassified report

DESCRIPTORS: *Lubricant additives, *Ethers, *Polymers, *Phenyl radicals, *Antioxidants, *Metalorganic compounds, *Tin, *Lubricants, Oxidation, Synthesis.

Tetraphenyltin and bis(p-phenoxyphenyl)diphenyltin perform well as antioxidants for polyphenyl ethers at 600-650 F in Bearing Rig test ratings. p-Bis(triphenylstannoxy)benzene is a third member of the organotin compounds screened that is an effective antioxidant for polyphenyl ethers. Other antioxidants that are effective for polyphenyl ethers are the metal salts of N,N-diphenyldithiocarbamic acid, triphenylbismuth and the oxides of copper. The most outstanding EP additive is diphenyltin bis(trichloroacetate) with an EP weld point greater than 720 kg. Testing a variety of lubricants in a modified Shell Four Ball apparatus (modified to detect metal-to-metal contact electrically) permits following the change from hydrodynamic to boundary type lubrication with increase in loading. A tentative mechanism is proposed to explain the results of controlled oxidations of m- and p-bis(phenoxy) benzenes - oxidation of polyphenyl ethers is accompanied by bond breaking (phenyl-oxygen) and coupling or condensation of intermediate to form higher molecular weight compounds. (Author)

AD-281 865 Div. 14, 17
(TISTM/MS) OTS price $1.25

Material Labs., Puget Sound Naval Shipyard, Bremerton, Wash.
REINFORCED PLASTIC COATINGS FOR THE PROTECTION OF STEEL SURFACES.
Progress rept.,
by M. E. Phelps. June 62, 36p. incl. tables.
(Rept. no. P-300-13)
Unclassified report

DESCRIPTORS: *Plastic coatings, *Antifouling coatings, Plastics, Metal plates, Steel, Surfaces, Corrosion, Deterioration, Sea water, Effectiveness.

Antifouling paints applied over plastic coated mild steel panels have been exposed to either

SUITABLE FOR ELECTRON TUBE SPACERS.
Final rept.,
by Edward E. Pollak. 13 Aug 62, 14p. incl. illus. tables, 5 refs. (Lab. proj. no. 5032-B-14.2)

Unclassified report

DESCRIPTORS: *Mica, Mica capacitors, Thermal conductivity, Quality control, Test methods, Standards, Physical properties, Mechanical properties, Heat treatment, Elasticity, Optical analysis, Reliability, Electron tubes.

An investigation aimed at developing and standardizing objective tests for mica, and mica-like materials, suitable for use in electron tubes, is completed. It is found that reliable and reproducible tests for the electrical properties, and the gas-content property of these materials are possible. Of all materials tested, synthetic mica is shown to have the lowest gas content. Phlogopite mica is shown, after appropriate heat treatment, to alter its properties in a direction which enhances its value as a tube spacer material. Other properties of mica, and of mica-like materials, such as optical axis and modulus of elasticity, are found to be reproducibly and reliably testable. (Author)

AD-282 328 Div. 14, 27, 22
(TISTM/EJH) OTS price $5.60

Ordnance Tank-Automotive Command, Detroit, Mich.
ENGINE CORROSION STUDY ON INSTALLED ENGINES AS A COMPONENT OF A COMBAT VEHICLE IN OUTDOOR STORAGE AT ANNISTON ORDNANCE DEPOT, ANNISTON, ALABAMA, CONDUCTED JULY 1958 - OCTOBER 1961.
Final rept. on Phase 1,
by James DeGroot. 29 June 62, 36p. incl. illus. (DA Proj. 593-21-062)

Unclassified report

DESCRIPTORS: *Tank engines, *Corrosion inhibition, *Engine cylinders, Storage, Corrosion, Weatherproofing, Coatings, Oil, Crystals, Spark plugs.

An attempt was made to increase the reprocessing cycle of installed engines in vehicles stored outdoors from the presently used one year to a minimum of 3 years. Despite improvements in application techniques, corrosion still occurs primarily in the cylinder area in less than one year. VCI oil proved far superior to the presently used MIL-L-21260 oil after a minimum of 3 years outdoor storage under actual conditions. Of 24 cylinders (2 test engines) using the VCI oil 17 were corrosion free after 3 years. The other 7 cylinders developed spotty and not too severe corrosion during the 3rd year of storage. MIL-L-21260 oil displayed sufficient corrosion on 12 of 24 cylinders to question satisfactory operation of the engine after reassembly without considerable rework and/or salvage. Half of the cylinders showed corrosion in the first year. There was no apparent attack from the VCI oil or VCI crystals on nonferrous or nonmetallic components of the engine. (Author)

AD-282 348 Div. 14, 17, 7, 12
(TISTM/GEC) OTS price $4.60

Aerospace Corp., Los Angeles, Calif.
MATERIALS PROBLEMS OF FLIGHT VEHICLE POWER,
by Rex A. Barney. 18 June 62, 40p. incl. illus. tables, 15 refs. (Rept. no. TDR-69(2703-01)TR-1)
(Contract AF 04(695)69)
(DCAS TDR 62-121) Unclassified report

DESCRIPTORS: *Auxiliary power plants, Storage batteries, Turbines, Fuel cells, Isotopes, Generators, Magnetohydrodynamics, Nuclear power plants, Solar cells, Thermoelectricity, Thermal radiation, Boilers, Energy, Metals, Alloys, Ceramic materials, Plastics, Thermionic emission, Refractory materials, Coatings, Space flight, Satellite vehicles, Spaceships, Materials.

Major objectives in materials research for energy conversion devices are: reliability, elevation of operating temperatures, weight reduction of auxiliary space power units, and suitability for the outer-space environment. Materials for flight vehicle power sources are listed. The materials requirement, materials presently being used or proposed, and the limitations or areas of improvement are listed for each source. Radioisotope generator materials are also given. (Author)

AD-282 356 Div. 14
(TISTW/DLW) OTS price $9.10

Ordnance Tank-Automotive Command, Detroit, Mich.
AN ELECTROLYTIC PAINT SYSTEM,
by David K. Wilburn. 1962, 103p. incl. illus. tables (Rept. no. RR-49)
(DA Proj. 572-01-001)

Unclassified report

Original contains color plates; all ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: *Cathodic protection, *Vehicles, Corrosion, Reduction, Direct current, Effectiveness, Tests, Paints, Storage.

A practical electrolytic paint system is described and evaluated in terms of reducing atmospheric corrosion of military vehicles in storage. The system was applied on the body of a M-38-A1 test vehicle and subjected to a 3-yr outside exposure in the Detroit, Mich. area. Comparison is made between the electrolytic method of corrosion control and conventional ordnance exterior finishes for military motor vehicles. Protection is achieved by impressing a small dc voltage through the electrolytic paint. The vehicle body is then made cathodic with respect to an anodic conductive coating. The theory of the electrolytic paint system is discussed, and the potentials required for the protection of the test vehicle are outlined. A series of photographs illustrate the extent of corrosion occurring in the electrolytic system as well as in the conventional finish. (Author)

AD-282 380 Div. 14
(TISTM/ODN) OTS price $2.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
DYNAMIC CUSHIONING PROPERTIES OF RESILIENT POLYSTYRENE FOAM,
by John H. Mazzei. July 62, 25p. incl. illus. (DA Proj. 593-32-008)

Unclassified report

DESCRIPTORS: *Polymers, *Expanded plastics, *Styrenes, *Packaging, Dynamics, Impact shock, Instrumentation, Non-destructive testing, Physical properties, Materials, Electronic equipment, Shear stresses, Mechanical properties.

Resilient polystyrene foams of various densities were dynamically tested (to simulate actual packaging conditions) by dropping various weights on them from a constant height and electronically recording the resulting shock in terms of maximum acceleration and dynamic set. The acceleration values were found to decrease with increasing specimen thickness. The dynamic set values in the optimum loading region did not in any case exceed 10%. Actual packaging conditions were simulated by placing the polystyrene

DESCRIPTORS: *Filament wound construction, *Laminates, *Mechanical properties, *Creep, *Fatigue (Mechanics), *Glass textiles, Epoxy resins, Polymers, Esters, Reinforcing materials, Glass.

Work was conducted in eight different areas: uniaxial fixture construction, specimen fabrication, uniaxial compression testing, low cycle uniaxial fatigue studies, creep evaluations, diffusion effects, biaxial creep facilities, and biaxial fatigue facilities. (Author)

AD-282 206 Div. 14, 4
(TISTM/EJH) OTS price $2.60

Midwest Research Inst., Kansas City, Mo.
SYNTHESIS OF ELASTOMERS CONTAINING Si-N BONDS IN THE MAIN CHAIN.
Summary rept. no. 1, 26 June 61-28 June 62,
by L. W. Breed and R. L. Elliott. 28 June 62, 23p. incl. illus. tables, 5 refs.
(Contract DA 23-072-ORD-1687)
Unclassified report

DESCRIPTORS: *Elastomers, *Polymers, *Silicon compounds, *Nitrogen compounds, *Heat resistant polymers, Synthesis, Polymerization, Molecular structure, Stability, Thermal stresses, Hydrolysis, Molecular weight, Heterocyclic compounds, Catalysts, Ammonium radicals, Sulfates.

Synthesis of thermally and hydrolytically stable elastomers based on chains containing Si atoms bonded directly to N was concerned with preparation of alternately ordered Si and N atoms in the main chain. Cyclization was avoided by bridging N atoms along the chain with alkylene groups which act as templates to prevent formation of small rings. Studies of polymerization variables failed to reveal methods of preparing materials with molecular weights greater than 7,500 to 15,000. A series of monomers and intermediates was prepared. Polymerization was effected by heating the monomer in the presence of ammonium sulfate. The linear manner of polymerization was established on the basis of experimental data including analyses for elements, molecular wt and IR spectra. Although the polymers were low melting, some were rubbery at room temperature.

AD-282 236 Div. 14
(TISTM/AW) OTS price $2.60

College of Aeronautics, Cranfield (Gt. Brit.).
CHARACTERISTICS OF THE HIGH TEMPERATURE MECHANISMS OF CREEP AND RECOVERY IN GRAPHITE.
Final technical rept. no. 1, 1 July 61-30 June 62. 30 June 62, 12p. illus.
(Contract DA 91-591-EUC-1759)
Unclassified report

DESCRIPTORS: *Graphite, Creep, Deformation, Stresses, High temperature research, Test methods, Vacuum apparatus, Laboratory equipment.

The first year's work on the high temperature mechanisms of creep and recovery in graphite is summarized. This work has been devoted to the building of an experimental apparatus capable of exerting creep loads to 1-inch diameter tubes with a wall thickness of .060 inches in the temperature range 2000 to 3000 C. A full description of the apparatus is given and its further potential is discussed. (Author)

AD-282 237 Div. 14
(TISTM/ODN) OTS price $.75

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
ENGINEERING STUDIES ON SOLUBILIZATION ADDITIVES FOR WATER IN MINERAL OIL,
by Charles B. Jordan. 20 Apr 62, 18p. incl. tables, 2 refs. (Rept. no. CCL-118)
Unclassified report

DESCRIPTORS: *Solubility, *Water, *Mineral oils, *Additives, Hydraulic brakes, Fluids, Hydraulic fluids, Mixtures, Alcohols, Amides, Amines, Esters, Ethers, Organic acids, Hydrocarbons, Sulfonates, Metal-organic compounds, Oximes, Hydrazines, Cyanates.

The object of the study was to find an additive capable of solubilizing small amounts of water in mineral oil throughout the temperature range of -65 F to +400 F. Hydrophilic substances which were soluble in mineral oil were tried. When none proved satisfactory, hundreds of available organic chemicals containing different functional groups were tried, in the event that some of these materials would exhibit unpredicted favorable solubilization properties. The trend of solvency in relationship to carbon content within each individual homologous series was studied. Although there were instances where solubilization occurred, no single additive or mixture was found which would give the desired results over the specified temperature range. (Author)

AD-282 239 Div. 14
(TISTM/AW) OTS price $2.60

Servo Corp. of America, Long Island, N. Y.
INVESTIGATION OF LONG WAVELENGTH INFRARED GLASSES.
Interim engineering rept. no. 1, 16 Apr-15 July 62,
by C. J. Billian. 15 July 62, 23p. incl. illus. table, 2 refs.
(Contract AF 33(657)8560)
Unclassified report

DESCRIPTORS: *Infrared optical materials, *Optical glass, Wave transmission, Purification, Infrared radiation, Infrared optical systems, Measurement, Physical properties, Absorption, Refractive properties, Reflection, Countermeasures, Optical coatings, Selection, Arsenic, Sulfur, Selenium, Tellurium.

Information on infrared transmitting glasses is presented. This information consists of composition-property data obtained on new glasses selected from the As-S-Se-Te field. Part I is essentially a property measurement section designed to determine selected optical, thermal and physical properties on 20 different glass compositions. Samples were selected from a collection of proprietary glasses developed from the As-S-Se-Te composition field. The glasses are in the process of being melted. Part II consists of developing new glass compositions having transmittance to beyond 16 microns. The best glasses from Part I are used as a basis with additions of other elements to obtain additional glasses with improved infrared transmission characteristics. A rapid method for preliminary evaluation of glass compositions was developed for evaluating a wide variety of composition changes in a short time. This method was utilized to examine numerous glasses comprised of As, Se, and Te with additions of Cu, Sb, Ag, and Bi. Results are given in terms of composition and extent of glass formation. A detailed description of the method is provided. (Author)

AD-282 259 Div. 14, 8
(TISTM/MS) OTS price $1.60

Material Lab., New York Naval Shipyard, Brooklyn.
RESEARCH AND DEVELOPMENT ON STANDARDIZATION OF OBJECTIVE TESTS FOR MICA AND MICA-LIKE MATERIALS

samples in a standard container with a simulated packaged item. The information and data obtained should serve as a guide for the use of resilient polystyrene foam as a package cushion. Use of these curves in conjunction with established prerequisites will facilitate the efficient use of these materials. (Author)

AD-282 458 Div. 14, 4
(TISTM/EJH) OTS price $1.60

Naugatuck Chemical Div., United States Rubber Co., Conn.
SYNTHESIS OF REGULATED STRUCTURE POLYPHENYLETHER-SILOXANE ELASTOMERS.
Quarterly progress rept. no. 4, 1 Apr-30 June 62, by Robert MacFarlane, Jr. 30 June 62, 10p. incl. tables.
(Contract DA 19-020-ORD-5507)
Unclassified report

DESCRIPTORS: *Heat resistant polymers, *Elastomers, *Polymers, Ethers, Hydroxides, Phenyl radicals, Silicones, Silanes, Chlorides, Alkoxy radicals, Methyl radicals, Vinyl radicals, Polymerization, Copolymerization, Mechanical properties, Synthesis.

Copolymers of siloxanes with phenyl ether blocks were prepared using an alcoholysis reaction and by direct condensation of a dihydroxy phenyl-ether derivative with dichlorosilanes. These copolymers were crosslinked to give materials exhibiting elasticity in the temperature range 75 to 400 C. The alkaline hydrolysis reaction which had resulted in a 47% yield of 4,4'-dihydroxy diphenylether resulted in a 15% yield when scaled to a 20 gallon reactor. Methoxy substituted diphenyl ether is the main product. An attempt to convert the methoxy substituted groups to hydroxyl groups by treatment with anhydrous aluminum chloride was unsuccessful. Attempts to replace methanol as a cosolvent in the alkaline hydrolysis reaction with an inert cosolvent as well as other methods of synthesis are as yet unsuccessful. Attempts to synthesize methylvinyldiethoxysilane in preparation for the alcoholysis condensation polymerization of regulated polyphenylethersiloxanes were partially successful. (Author)

AD-282 461 Div. 14, 32
(TISTM/GEC) OTS price $1.60

North American Aviation, Inc., Downey, Calif.
NON-DESTRUCTIVE TESTING OF ADHESIVE BONDED JOINTS: A PARTIALLY ANNOTATED BIBLIOGRAPHY.
Rept. for 1947-July 61.
8 Jan 62, 11p. (Rept. no. SID 62-26)
Unclassified report

DESCRIPTORS: *Bonded joints, *Bibliography, *Non-destructive testing, Adhesives, Bonding, Ultrasonics, Infrared radiation, Electrical properties.

Most of the items listed are technical reports and refer to ultrasonic testing methods. (Author)

AD-282 462 Div. 14
(TISTM/ODN) OTS price $2.60

North American Aviation, Inc., Downey, Calif.
LUBRICANTS AND BEARINGS AT ULTRA-HIGH TEMPERATURES: A PARTIALLY ANNOTATED BIBLIOGRAPHY.
17 Jan 62, 23p. (Rept. no. SID 62-107)
Unclassified report

DESCRIPTORS: *Literature, *Lubricants, *Bearings, *High temperature research, *Friction, *Bibliography.

A survey of the unclassified literature since 1959 on friction, lubrication, and bearings at temperatures above 1200 F is given. (Author)

AD-282 465 Div. 14, 32
(TISTM/GEC) OTS price $1.60

North American Aviation, Inc., Downey, Calif.
CERAMIC FOAM AND CERAMIC HONEYCOMB: A LITERATURE SURVEY.
9 Feb 62, 8p. 42 refs. (Rept. no. SID 62-241)
Unclassified report

DESCRIPTORS: *Bibliography, *Ceramic materials, Foams, Honeycomb cores.

A survey of unclassified literature from 1956 to the present date on ceramic foam and ceramic honeycomb is given. (Author)

AD-282 545 Div. 14
(TISTM/GEC) OTS price $1.60

Narmco Industries, Inc., San Diego, Calif.
POTENTIAL OF FILAMENT WOUND COMPOSITES.
Monthly progress rept. no. 15, 1-31 July 62, by W. H. Otto, S. Dharmarajan and others.
31 July 62, 11p. incl. illus. table.
(Contract NOw 61-0623-c)
Unclassified report

DESCRIPTORS: *Composite materials, *Filament wound construction, Glass textiles, Epoxy resins, Reinforcing materials, Tensile properties, Humidity, Stresses, Rupture, Laminates, Aging, Temperature, Deformation, Theory, Failure (Mechanics), Fatigue (Mechanics), Mathematical analysis.

The effect of humidity on the tensile strength of E-glass fibers coated with epoxy resin is reported for cycling periods up to 28 days. The experimental data on the study of the effect of fiber tension during resin cure and stress rupture tests at room temperature are reported. The large deflection theory of asymmetrically laminated anisotropic plates is adopted for small deformations of asymmetrically laminated, anisotropic, rectangular plates under biaxial tension. (Author)

AD-282 601 Div. 14, 17
(TISTM/PCR) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
EVALUATION OF MATERIALS FOR SPACECRAFT APPLICATIONS.
Technical rept.,
by F. J. Clauss. June 61, 24p. incl. illus. tables (Rept. no. 5-10-61-11)
Unclassified report

DESCRIPTORS: *Space environmental conditions, Friction, Bearings, Gears, Electric connectors, Vacuum systems, Temperature control, Thin films, Polymers, Ultraviolet radiation, Adhesives, Organic compounds, Dielectrics, Gaskets, Propellants, Welding, Evaporation, Sublimation, Radiation effects, Materials.

Research is described on the effects of space conditions on material behavior. The following particular areas of research are discussed: (1) friction and wear of gears, bearings, and electrical contacts under high vacuum; (2) stability of temperature-control surfaces and thin films of organic polymers under ultraviolet radiation and high vacuum; and (3) stability of organic adhesives under high-energy radiation and high vacuum. (Author)

AD-282 636 Div. 14, 25
(TISTM/RD) OTS price $1.60

Stanford Research Inst., Menlo Park, Calif.
BETA-SILICON CARBIDE AND ITS POTENTIAL FOR DEVICES.

Quarterly technical rept. no. 2, 1 May-31 July 62,
by W. E. Nelson and F. A. Halden. 15 Aug 62, 7p. incl. tables (Rept. no. 6)
(Contract NObsr-87235)
Unclassified report

DESCRIPTORS: *Silicon compounds, *Carbides, *Single crystals, Semiconductors, Crucibles, Vapor plating, Nitrogen, Chemical impurities, Growth.

The first low-nitrogen beta-silicon carbide crystals were grown. Analysis revealed a tenfold decrease in nitrogen contamination compared with crystals grown previously. Electrical measurements of the low-nitrogen crystals (3.4 x 10 to the 17th power atoms/cc showed an order-of-magnitude increase in resistivity to 0.45 ohm-cm. Successful crystal growth runs were made in pyrolytic graphite-coated UF-4S graphite crucibles and in purified, high-density graphite crucibles. (Author)

AD-282 680 Div. 14, 17
(TISTW/PCR) OTS price $2.60

RIAS, Inc., Baltimore, Md.
EFFECTS OF SURFACE AND ENVIRONMENT ON THE MECHANICAL PROPERTIES OF MATERIALS.
Final rept., Oct 60-June 62,
by A. R. C. Westwood and M. H. Kamdar. June 62, 25p. incl. illus. 28 refs.
(Contract DA 36-034-505-ORD-3349)
(WAL TR 832/1-6) Unclassified report

DESCRIPTORS: *Crystals, *Liquid metals, *Crystal structure, *Deformation, Brittle materials, Molecules, Adsorption, Lithium compounds, Fluorides, Single crystals.

Observations and conclusions are briefly reported on: (1) effects of adsorbed polar molecules on the mechanical and dissolution behavior of ionic crystals, (rebinder-effect, etch-tunneling phenomenon, anomalous solution and etching phenomenon, etc.); (2) the surface sensitive behavior of ionic crystals; and (3) embrittlement by liquid-metals. (Author)

AD-282 700 Div. 14
(TISTM/ODN) OTS price $3.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
MECHANICAL TESTING OF ADHESIVES IN A CREEP FURNACE AT TEMPERATURES RANGING FROM 200 TO 2,400 F.
by Adolph E. Slobodzinski. Sep 62, 37p. incl. illus. (Technical memo. no. 1061)
(DA Proj. 593-32-008)
Unclassified report

DESCRIPTORS: *Adhesives, *High temperature research, *Tensile properties, Heat, Thermocouples, Temperature, Electrical equipment, Electronic equipment, Aluminum, Stainless steel, Surfaces, Voltage, Tests, Temperature control, Creep, Laboratory furnaces.

A tensile testing capability was developed for testing the strength of plastics and adhesives at temperatures up to 2,000 F for prolonged periods and up to 2,400 F for short periods. A cylindrical electric furnace with accessories was made up from standard components such as are used for studies of creep in metals. Only minor changes in the wiring of the standard control panel and the addition of a voltage regulator were needed to make the installation capable of providing reproducible temperatures as low as 200 F. Normally, 400 F is considered the lowest available test temperature limit for this apparatus. It was found that the time required to bring the specimen to temperature could be reproduced. It is also possible to control the rate of heating for each temperature over significantly wide ranges. The use of instrumented dummy specimens was found helpful in establishing the temperature conditions to be expected at a simulated glue line. (Author)

AD-282 719 Div. 14, 4
(TISTM/MS) OTS price $2.00

New York U. Coll. of Engineering, N. Y.
DEVELOPMENT OF IMPROVED TITANIUM ORGANIC COMPOUNDS FOR USE AS HYDRAULIC FLUIDS.
Technical rept. no. 1, 16 Feb-15 May 62.
15 June 62, 72p. incl. illus. tables.
(Contract NOw 62-0647-d; Continuation of Contract NOw 61-0434-d)
Unclassified report

DESCRIPTORS: *Hydraulic fluids, *Titanium compounds, *Titanates, *Complex compounds, *Silicones, *Metalorganic compounds, *Silanes, Metals, Octanoic acids, Hydrolysis, Stability, Reduction, Viscosity, Friction, Oxidation-reduction reactions, Resistance, Temperature, Cresyl radicals, Alkyl radicals, Phosphates, Organic compounds, Inhibition, Cerium, Chlorides, Sulphates, Toluenes, Nitrates, Zinc compounds, Iron compounds, Propyl radicals, Nuclear magnetic resonance, Additives, Oxidation inhibitors, Tests.

An increase of the oxidation reduction test resistance of the reaction product between tetra-isopropyl titanate and basic zinc octoate without the need of a subsequent stabilization with other reactive components, such as tetraalkylsilane which was used in the preceding contract, is reported. The increased resistance is sought by removal of residual reactive groups, primarily by partial hydrolyzation in the presence of limited amount of water. The resulting product is studied. A study introduces new groups into the reaction products with the aim of increasing the flame resistance or for self extinguishing properties in the fluid material. (Author)

AD-282 773 Div. 14
(TISTM/GEC) OTS price $4.60

Black, Sivalls and Bryson, Inc., Ardmore, Okla.
(No title).
Final rept.,
by E. J. Jones, S. Scott, and E. S. Kinkade.
1 July 62, 40p. incl. illus. (Engineering rept. no. 052)
(Contract Nonr-345300)
Unclassified report

Original contains color plates; all ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: *Glass textiles, *Pressure vessels, Manufacturing methods, Plastic coatings, Epoxy resins, Filament wound construction, Hydrostatic pressure, Temperature, Tests, Test methods, Composite materials, Mechanical properties, Tensile properties.

Six high pressure bottles were fabricated and tested in order to determine the glass exhibiting higher strength of the two types tested, and to compare the effects of elevated temperature on 801-finish glass. The strength qualities at 75 F of Owens-Corning ECG-140 continuous-filament roving glass with an 801 epoxy compatible finish and the same glass with an HTS epoxy compatible finish were tested. The strength qualities of Owens-Corning ECG-140 continuous filament roving glass with an 801 epoxy compatible finish was tested at 75 and 250 F. (Author)

# Division 14 - MATERIALS (NON-METALLIC)

AD-282 795 Div. 14, 32
(TISTM/MS) OTS price $1.50

Plastics Technical Evaluation Center, Picatinny Arsenal, Dover, N. J.
SUBJECT INDEX, BIBLIOGRAPHY, AND CODE DESCRIPTION OF TECHNICAL CONFERENCE PAPERS ON PLASTICS: 15 FEBRUARY 1961-23 FEBRUARY 1962,
by Arnold E. Molzon. June 62, 55p. 10 refs.
(Plastec rept. no. 11)

Unclassified report

DESCRIPTORS: *Plastics, *Bibliography, Conferences, Materials, Indexes, Polymers, Physical properties, Mechanical properties.

The papers presented at the technical conferences on plastic materials and related technology, within a 1-year period ending 23 February 1962, have been listed and indexed by subject. Over 400 papers from 10 conferences are covered. This report serves as a guide to the subjects presented, and by means of a numerical code system, it tells the reader what type of information each article contains. Included are a bibliography and lists of references, thereto, on plastic materials and technical data. The conferences were: 18th Annual Technical Conference of the Society of Plastics Engineers; 17th Annual Technical and Management Conference of the Reinforced Plastics Division of the Society of the Plastics Industry; 4th National Conference on the Application of Electrical Insulation; National Academy of Sciences-National Research Council Conference on Electrical Insulation; Symposium on Adhesives for Structural Applications; 10th Annual Conference on Technical Progress in Communication Wire and Cable; Filament Winding Conference; Materials Symposium, Air Force Aeronautical Systems Division; 1961 Electronic Circuit Packaging Symposium; Fall Meeting of the American Chemical Society (Division of Organic Coatings and Plastics Chemistry). (Author)

AD-282 802 Div. 14
(TISTM/GEC) OTS price $1.60

Smith, A. O. Corp., Milwaukee, Wis.
GLASS SURFACE CHEMISTRY FOR GLASS FIBER REINFORCED PLASTICS.
Monthly progress rept. no. 5, 1-31 July 62 on Effect of Glass Surface Chemistry on Wetting, Bond Strength and Bond Life of an Epoxy Resin. 15 Aug 62, 11p. incl. illus. tables, 4 refs.
(Contract NOw 62-0679-c)

Unclassified report

DESCRIPTORS: *Laminates, *Reinforcing materials, Bonding, Adhesion, Tensile properties, Wetting agents, Plastics, Alkali metal compounds, Failure (Mechanics), Mechanical properties, Test methods, Tests, Water, Surface properties, Epoxy resins, Glass textiles.

Study continued of the glass surface chemistry for glass fiber reinforced plastics. In evaluating different glass surfaces by the flat plate test, all types of surfaces not treated with a coupling agent failed within 24 hr. The alkali-deficient surface under the same condition has lasted a remarkable 37 days and failure has not been encountered. In preparing the alkali-deficient surface, the glass was etched to remove the alkali. The glass surface was thus not as smooth as other types of glass surfaces. Whether the longer bond life was due to chemical (removal of alkali and formation of a silica-rich film) or mechanical (roughness) bonding is not yet known. In order to determine whether failure in the flat plate specimens was due to water proceeding along the edges or through the resin, experiments were conducted by using a water column that subjected only the central portion of the resin surface to the 190 F water. The interesting result was that the flat plate specimen subjected to the water column failed as rapidly as the specimen entirely immersed in water. Since each component (glass, interface, and resin) contribute a different tensile force to the measured tensile force, reproducibility will be considerably improved when the type of failure is considered in calculating the stress. (Author)

AD-282 868 Div. 14, 12
(TISTM/MS) OTS price $4.60

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
BEHAVIOR OF PURE AND REINFORCED CHARRING POLYMERS DURING ABLATION UNDER HYPERVELOCITY RE-ENTRY CONDITIONS,
by L. McAllister, J. Bolger and others. 1961, 50p. incl. illus. tables, 17 refs.
(Contract AF 04(647)258)

Unclassified report

DESCRIPTORS: *Polymers, *Epoxy resins, Microstructures, X-ray diffraction analysis, Ablation, Re-entry aerodynamics, Thermal stresses.

Arc tests conducted on a series of cured epoxy resins indicated that a novolac structure in the polymer, and a system functionality in excess of 2.14 and possibly as high as 2.6, are necessary for ablative char formation in the systems tested. In addition, certain acids, when added to noncharring epoxies, induced char formation in arc tests. A mechanism of char layer formation and removal has been postulated wherein the polymer undergoes thermal degradation to form carbonaceous residue and gaseous products; the gaseous products percolate through the carbonaceous char, undergo further thermal decomposition, and deposit pyrolytic graphite on the carbonaceous cell walls and silica fibers (if present); the surface is removed by mechanical and chemical erosion, i.e., silicacarbon reaction and/or graphite oxidation. Photomicrographs of char layer cross-sections show details of pyrolytic graphite microstructure and graphite-silica interactions. X-ray diffraction patterns show that silicon carbide is the principal crystalline component in the surface zone of the char layer of the silica reinforced materials. Examination of arc specimens indicates that the char layer fluctuates in thickness, but shows an average increase in thickness during the exposure. The fluctuation in thickness appears to be due to a periodic weakening and removal of the char surface zone. (Author)

AD-282 935 Div. 14
(TISTM/JRG) OTS price $.50

Naval Civil Engineering Lab., Fort Hueneme, Calif.
REMOVAL OF ASPHALT FROM DRUMS.
Final rept.,
by C. A. Scharpf, J. H. Sams, and J. S. Williams. 29 June 62, 18p. incl. illus. (Technical rept. no. R-205)
(Proj. Y-F015-99-006)

Unclassified report

DESCRIPTORS: *Asphalt, *Containers, Handling, Disposal, Roads, Materials, Steel.

Two methods of removing asphalt from drums were investigated which promise to be superior to present methods in general use at overseas installations. In one method, the inside of the drum is coated with a release agent, such as a silicone film, to prevent adherence of the asphalt. When ready for use, the metal drum is cut and stripped away and the contents allowed

to fall into the melting kettle. Clean separation is readily obtained at drum surface temperatures below 92 F, but the removal becomes increasingly difficult above that temperature. Coating the drums with reflective paints and storing the drums in the shade until required are effective means of maintaining low-surface temperatures. In the other method, the full drum, with head removed, is immersed briefly in hot water and then inverted. The weight of the asphalt causes it to slide out of the container. Although this method does not require use of an interior film on the drum, a slightly larger quantity of product remains behind when the cylindrical slug of asphalt falls out. (Author)

AD-282 959 Div. 14
(TISTA/GEC) OTS price $3.60

Office of the Director of Defense Research and Engineering, Washington, D. C.
AEROSPACE LUBRICATION SURVEY,
by Neal W. Furby, S. M. Collegeman and others.
Aug 61, 34p. incl. tables.
Unclassified report

DESCRIPTORS: *Lubrication, *Lubricants, Low pressure research, Gas bearings, Solids, Films, Oxidizers, Liquid rocket propellants, Rocket oxidizers, Turbines, Space environmental conditions, Low temperature lubricants, High temperature research, Heat resistant polymers, Nuclear energy, Data, Tables, Indexes, Space flight, Scientific research.

A list of organizations and government agencies engaged in research in the field of aerospace lubricants is presented. The list provides the area of interest of the company, temperature range, pressure, duration, specific lubricants of interest, test equipment, load, and operating speed for the lubricants.

AD-282 982 Div. 14
(TISTM/DLW) OTS price $3.60

Solar Aircraft Co., San Diego, Calif.
EXPLORATION AND EVALUATION OF NEW GLASSES IN FIBER FORM.
Bimonthly progress rept. no. 4, 16 May-15 July 62,
by Gunther K. Schmitz. 21 Aug 62, 26p. incl. illus. tables, 9 refs. (Technical memo. no. 199; RDR 1266-5)
(Contract Nonr-365400)
Unclassified report

DESCRIPTORS: *Glass textiles, *Glass, Failure (Mechanics), Tensile properties, Fibers, Mechanical properties, Test methods, Tests.

Tensile strength data obtained to date from E-glass and X-994 fibers were reviewed and analyzed. Results from other sources are cited for comparison. The length effect on the breaking strength of fibers is discussed. Shorter fibers yield higher strength values. At extremely short test lengths, the breaking strength levels off at a constant value. Strength properties of X-994 fibers are superior to E-glass by a factor of 1.5 if compared on the basis of E modulus, average strength, and fiber density. The strength of strands does not always follow the length/strength relationship typical for single fibers; poor fiber collimation and varying pretension of the strands are the major causes. (Author)

AD-283 018 Div. 14, 8, 12
(TISTM/DLW) OTS price $4.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
HIGH TEMPERATURE CERAMIC STRUCTURES.
Quarterly rept. no. 24, 1 May-31 July 62,
by N. E. Poulos, S. R. Elkins, and J. D. Walton.
31 July 62, 37p. incl. illus. tables.
(Contract NOrd-15701, Proj. A-212)
Unclassified report

DESCRIPTORS: *Ceramic materials, *Radomes, *Guided missile noses, *Manufacturing methods, Silicates, Flame spraying, Impregnation, Pressure, Casting, Dioxides, Cylindrical bodies, Organic compounds, Porosity, Processing, Design, Tests, Silicon compounds, Refractory materials, Materials.

Effort was directed towards improving the green and fired properties of slip-cast fused silica, investigating annealing procedures for flame glazed slip-cast fused silica, and designing and fabricating a device to totally arc-plasma flame glaze the outer surfaces of three radome shapes. The organo-silicate impregnation studies were continued, using the simple exposure impregnating technique, then gelling with concentrated sulfuric acid to hold the organo-silicate in place. Pressure casting studies continued and expanded so that the data could be statistically analyzed to determine significant differences in the properties of test bars of slip-cast fused silica due to pressure, firing procedure, and vibration. The design and construction of a device to arc-plasma flame glaze the complete outer surfaces of full scale fused silica radomes was initiated. (Author)

AD-283 085 Div. 14
(TISTM/PCR) OTS price $1.60

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
BALLISTIC PROTECTIVE BUOYANT MATERIALS.
Quarterly rept. no. 10, 1 Apr-30 June 62,
by Michael C. Jaskowski. 30 June 62, 17p. incl. illus. table.
(Contract N140(138)72793B; Continuation of Contract N140(138)68879B)
Unclassified report

DESCRIPTORS: *Buoyant materials, Protective coverings, Angle of arrival, Cellulose esters, Fibers, Life preservers, Ballistics.

The effect upon buoyancy of the angle of submerged batts was investigated. Buoyancy of each sample increased as its angle to the water surface approached zero. Hydrophobed hollow cellulose ester staple fibers did not exhibit sufficient buoyancy to warrant further testing. The buoyancy of an experimental needled batt was upgraded by additional curing. A program was initiated to study needling techniques for the preparation of suitable buoyant-ballistic liners. (Author)

## 15. MATHEMATICS

AD-281 730 Div. 15
(TISTP/TL) OTS price $4.60

Case Inst. of Tech., Cleveland, Ohio.
THE FIRST TWO MOMENTS OF THE RECIPROCAL OF THE POSITIVE HYPERGEOMETRIC VARIABLE,
by Zakkula Govindarajulu. May 62, 16p. table, 7 refs. (Statistical Lab. publication no. 1061)
(Grant no. AFOSR 62-72)
Unclassified report

DESCRIPTORS: *Statistical distributions, *Statistical functions, *Probability, Statistical analysis, Real variables, Numerical analysis.

Starting from the definitions, the first two inverse moments of a positive hypergeometric variable have been computed accurate to five decimal places for: N equals 1(1)20, M equals 1(1)N, n equals 1(1)M; N equals 25(5)50, M/N equals 5% (5%) 100%, n equals 1(1)M; N equals 55(5)100(10) 140 M/N equals 5% (5%) 100%, n/N (< M/N) equals 5% (5%) 100%. Many theoretical results of interest, recurrence formulae among the inverse moments, and various approximations for the first two inverse moments have been obtained. The rounding error involved in using the formulae recurrently, in order to compute the moments is at most 1-2 units in the last decimal place. The approximate values have been compared with the true values for some sets of values of N, M and n. For large values of N and n the Beta approximations are accurate up to 2-3 decimal places, provided they exist. (Author)

AD-281 908 Div. 15
(TISTP/TL) OTS price $1.10

System Development Corp., Santa Monica, Calif.
APPROXIMATE DISTRIBUTION OF EXTREMES FOR NONSAMPLE CASES,
by John E. Walsh. 23 July 62, 11p. 4 refs.
(Rept. no. SP-727)
Unclassified report

DESCRIPTORS: *Statistical analysis, *Statistical functions, *Statistical distributions, Sequences, Probability.

The data are n univariate observations that are not necessarily from continuous populations, from the same population, or independent. The problem is to determine an approximate expression for the distribution of a specified largest (or smallest) order statistic of these observations when they satisfy a type of m-dependence. General expressions are developed that depend on n, the order statistic considered, and the arithmetic average of the cumulative distribution functions (cdf's) for the individual observations. When the data are continuous and the average of the cdf's satisfies some additional conditions as n increases, the extremes have asymptotic distributions of the forms that occur for the case of a sample. These results may explain why many practical situations have been approximated by extreme-value theory that assumes samples. Also, a basis is furnished for deciding, from the characteristics of the situation, on the suitability of extreme-value methods. (Author)

AD-281 928 Div. 15
(TISTP/TL) OTS price $4.60

Hebrew U. (Israel).
EXTENSION OF COMPACT OPERATORS I,
by Joram Lindenstrauss. May 62, 45p, 18 refs.
(Technical scientific note no. 28)
(Contract AF 61(052)187)
Unclassified report

DESCRIPTORS: *Operators (Mathematics), *Functional analysis, *Topology, *Convex sets, Sequences, Numbers.

AD-281 929 Div. 15
(TISTP/TL) OTS price $4.60

Hebrew U. (Israel).
EXTENSION OF COMPACT OPERATORS II,
by Joram Lindenstrauss. June 62, 40p. 13 refs.
(Technical scientific note no. 31)
(Contract AF 61(052)187)
Unclassified report

DESCRIPTORS: *Topology, *Functional analysis, *Convex sets, *Operators (Mathematics), Sequences, Numbers.

AD-281 930 Div. 15
(TISTP/TL) OTS price $5.60

Hebrew U. (Israel).
EXTENSION OF COMPACT OPERATORS III,
by Joram Lindenstrauss. July 62, 53p. 26 refs.
(Technical scientific note no. 32)
(Contract AF 61(052)187)
Unclassified report

DESCRIPTORS: Topology, Functional analysis, Convex sets, Operators (Mathematics), Sequences, Numbers.

AD-281 931 Div. 15
(TISTP/TL) OTS price $2.60

Hebrew U. (Israel).
CONVEXITY THEOREMS AND LOWER BOUNDS FOR SOLUTIONS OF DIFFERENTIAL EQUATIONS IN BANACH SPACE,
by S. Agmon and L. Nirenberg. June 62, 26p. 3 refs. (Technical scientific note no. 33)
(Contract AF 61(052)187)
Unclassified report

DESCRIPTORS: *Convex sets, *Differential equations, *Functional analysis, *Topology, Inequalities, Real variables, Operators (Mathematics) Groups (Mathematics).

The purpose of this analysis is to show that similar results hold in a much more general case, when iA is a non-real multiple of an infinitesimal generator of a one parameter group of bounded operators in Banach spaces. The advantage of the result in this more general situation is that it applies to general Banach spaces and admits a much wider range of applications to differential problems. (Author)

AD-281 934 Div. 15
(TISTP/TL) OTS price $2.60

Minnesota U., Minneapolis.
CONTRIBUTIONS TO THE THEORY OF RANK ORDER STATISTICS: APPLICATIONS OF LATTICE THEORY,
by I. Richard Savage. 28 June 62, 20p. incl. illus. 5 refs. (Technical rept. no. 15)
(Contract Nonr-71031, Proj. NR 042-019
Unclassified report

DESCRIPTORS: *Statistical analysis, *Algebra, Convex sets, Theory, Vector analysis, Real variables, Statistical distributions, Statistical functions, Probability.

AD-282 032 Div. 15, 30
(TISTP/WH) OTS price $4.60

Microwave Research Inst., Polytechnic Inst., Brooklyn, N. Y.
FURTHER CONTRIBUTIONS TO THE REALIZATION OF BOOLEAN POLYNOMIALS BASED ON INCIDENCE MATRICES AND ITS PROGRAMMING ON THE IBM 650 COMPUTER,
by Yoshi Moriwaki. 22 Aug 61, 49p. incl. illus.
(Rept. no. PIBMRI-938-61)
(Contract AF 19(604)6620, Proj. 5632)
(AFCRL 62-189) Unclassified report

DESCRIPTORS: *Algebras, *Matrix algebra, *Electrical networks *Digital computers, Programming, Tables.

The most general procedure of finding minimum contact or minimum spring networks is described in Part I. This procedure is based on Dr. S. Okada's exhaustive method of synthesizing contact networks. In Part II, explanations of the programs which carry out the procedures described in Part I by the IBM 650 computer are given. Flow charts are used to facilitate the understanding. The detailed programs are given in the Appendix. Some of the results obtained are

described in Part III. Many circuits with less number of springs than those previously known are found. In addition, many series-parallel circuits with the minimum number of contacts are described. (Author)

AD-282 094 Div. 15
(TISTP/TL) OTS price $1.60

Boeing Scientific Research Labs., Seattle, Wash.
SOME RELATIONSHIPS BETWEEN THE TCHEBYCHEFF APPROXIMATION ON AN INTERVAL AND ON A DISCRETE SUBSET OF THAT INTERVAL,
by E.W. Cheney. June 62, 12p. 6 refs.
(Mathematical note no. 262; D1-82-0185)
Unclassified report

DESCRIPTORS: *Polynomials, *Functions, *Convex sets, Nonlinear systems, Algebra, Determinants, Inequalities.

AD-282 108 Div. 15
(TISTM/MS) OTS price $4.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
SOCIAL WELFARE FUNCTION AND SOCIAL INDIFFERENCE CURVES,
by Ken-ichi Inada. 18 July 62, 40p. incl. illus. 8 refs. (Technical rept. no. 117)
(Contract Nonr-22550, Proj. NR 047-004)
Unclassified report

DESCRIPTORS: *Economic conditions, *Applied mathematics, *Functions, Mathematical analysis.

AD-282 195 Div. 15
(TISTP/WH) OTS price $9.60

Goteborg U. (Sweden).
TABLES OF NORMAL AND LOG-NORMAL RANDOM DEVIATES, PART II,
by Hannes Hyrenius and Rune Gustafsson. 1962, 109p. incl. tables.
(Contract AF 61(052)459)
Unclassified report

DESCRIPTORS: *Statistical distributions, *Numerical methods and procedures, *Sampling, *Analysis of variance.

This second part of the Tables of Normal and Log-normal Random Deviates contains 5 sets of 10,000 deviates each, namely one series of 10,000 distribution-corrected random normal deviates and four transforms to log-normal deviates. All the five sets have the mean = 0 and the variance = 1; the log-normal sets have the skewness gamma sub 1 = 0.2, 0.5, 1.0 and 2.0 respectively. (Author)

AD-282 196 Div. 15
(TISTP/WH) OTS price $9.10

Goteborg U. (Sweden).
TABLES OF NORMAL AND LOG-NORMAL RANDOM DEVIATES, PART I,
by Hannes Hyrenius and Rune Gustafsson. 1962, 83p. incl. illus. tables.
(Contract AF 61(052)459)
Unclassified report

DESCRIPTORS: *Statistical distributions, *Numerical methods and procedures, *Sampling, *Analysis of variance.

Contents:
Transformation of normal deviates to log-normal deviates
Derivation of distribution-corrected normal deviates in series of different size
Randomization of series
Comments on derived series of distribution-corrected random normal deviates
Derivation of series of random log-normal deviates

AD-282 240 Div. 15
(TISTP/WH) OTS price $1.60

RAND Corp., Santa Monica, Calif.
ON SOME QUESTIONS ARISING IN THE APPROXIMATE SOLUTION OF NONLINEAR DIFFERENTIAL EQUATIONS,
by Richard Bellman and John M. Richardson.
June 62, 15p. incl. illus. table, 6 refs. (Memo. no. RM-3180-PR)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: *Non-linear differential equations.

A new approach to the approximate solution of nonlinear differential equations is explored. The basic idea is to rewrite the nonlinear equations in the form of an infinite sequence of coupled linear equations by application of the Carleman linearization process. The sequence is truncated at a finite stage by a linear closure approximation involving the minimization of the mean square error. Attention is given to the stability of the truncated sequence of linear equations with respect to propagation of error due to closure back to the earlier members of the sequence. The use of suitably defined orthogonal polynomials to simplify closure approximations is considered. The generalization of the general method to the multidimensional case is treated. Consideration is given to the concept of self-consistent closure methods in which the averaging of the squared closure error depends upon the approximate linear equations derived thereby. (Author)

AD-282 241 Div. 15
(TISTP/TL) OTS price $1.60

RAND Corp., Santa Monica, Calif.
SUPPORTS IN SEMI-SIMPLE RINGS,
by Howard Osborn. June 62, 7p. 1 ref. (Memo. no. RM-3211-PR)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: *Algebraic topology, Vector analysis, Differential equations, Functions, Convex sets.

AD-282 264 Div. 15
(TISTP/TL) OTS price $8.10

Applied Mathematics and Statistics Labs., Stanford U., Calif.
THE THEORY OF THE SECOND VARIATION IN EXTREMUM PROBLEMS FOR UNIVALENT FUNCTIONS,
by P. L. Duren and M. Schiffer. 23 July 62, 84p. 30 refs. (Technical rept. no. 111)
(Contract Nonr-22511, Proj. NR-041-086)
Unclassified report

DESCRIPTORS: *Functions, *Calculus of variations, *Differential equations, Inequalities, Integration, Green's function.

An attempt is made to improve the method of variations by considering further necessary conditions for the extremum function which arises from a study of the second variation. The formulas for the second variation of coefficients of univalent functions are, in general, so involved as to be impractical for a finer study of the extremum function. However, using the fact that this function satisfies a differential equation due to the first variational condition, success was reached in simplifying the expressions considerably. It was shown that a whole new set of necessary extremum conditions can be obtained to test every competing solution of the first variational condition. The new extremum conditions have the form of quadratic inequalities which are similar in type to those occurring

through the method of contour integration. The characteristic difference lies in the fact that the quadratic inequalities have only to hold in the case of the extremum function, while in the other case the inequalities are asserted for all univalent functions. Nevertheless, it seems that the theory of the second variation is more closely connected with the method of contour integration than is that of the first variation. It might be possible to combine both methods for a unified approach to the general coefficient problem. (Author)

AD-282 322 Div. 15
(TISTP/GRW) OTS price $1.60

Institute of Mathematical Sciences, New York U., N. Y.
SOME REMARKS CONCERNING THE BREMMER SERIES,
by Irvin Kay. Mar 62, 13p. 8 refs. (Research rept. no. EM-173)
(Contract AF 19(604)3495)
(AFCRL 62-48) Unclassified report

DESCRIPTORS: *Differential equations, *Series, Integral equations.

An attempt was made to clarify certain questions about the convergence of the Bremmer series solution of a linear second order differential equation. It is shown that series of the Bremmer type exist and have convergence properties. (Author)

AD-282 337 Div. 15
(TISTP/GRW) OTS price $4.60

RAND Corp., Santa Monica, Calif.
EXTERIOR CALCULUS ON MODULES,
by Howard Osborn. Aug 62, 37p. 1 ref. (Memo. RM-3222-PR)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: *Algebras, Polynomials, Functional analysis.

An exterior calculus is defined on an arbitrary module over a commutative ring with unit, which reduces to the classical exterior calculus with polynomial coefficients in case the module is a real finite-dimensional vector space. Analogs of the Poincare lemma and the existence theorem for conservation laws are proved, the latter by means of an explicit representation. (Author)

AD-282 353 Div. 15
(TISTP/GRW) OTS price $1.10

Air Force Cambridge Research Labs., Bedford, Mass.
ON THE SOLUTION OF LINEAR DIFFERENTIAL EQUATIONS OF SECOND ORDER WITH VARIABLE COEFFICIENTS,
by M. H. Bruce and R. E. Murphy. May 62, 5p. 2 refs. (AFCRL 62-307)
(Proj. 4649)
Unclassified report

DESCRIPTORS: *Differential equations, *Equations, Integrals.

A method is introduced whereby the solution of a linear differential equation of the second order with variable coefficients is determined as a series of indefinite integrals performed on one of the coefficients. The method gives immediate solutions with a minimum of calculations when the appropriate integrals can be performed. An illustrative example is included. (Author)

AD-282 416 Div. 15
(TISTP/GRW) OTS price $10.10

Hebrew U. (Israel).
COMPLEX FUNCTION THEORY OVER NON-ARCHIMEDEAN FIELDS,
by Abraham Robinson. June 62, 127p. 28 refs. (Technical (scientific) note no. 30)
(Contract AF 61(052)187)
Unclassified report

DESCRIPTORS: *Functions, Mathematical logic, Polynomials.

A satisfactory theory of complex functions is shown to exist over certain non-Archimedean fields. The theory is applied to the simplification and development of some branches of classical Function Theory. New results are obtained concerning the zeros of complex polynomials and on the behavior of an analytic function in the neighborhood of an essential singularity. Mathematical Logic provides a basic part of the arguments. (Author)

AD-282 425 Div. 15
(TISTP/GRW) OTS price $1.60

Hebrew U. (Israel).
MIXED PROBLEMS FOR HIGHER ORDER HYPERBOLIC EQUATIONS,
by Shmuel Agmon. May 62, 9p. 14 refs. (Technical (scientific) note no. 29)
(Contract AF 61(052)187)
Unclassified report

DESCRIPTORS: *Partial differential equations.

Mixed problems for higher-order hyperbolic equations in any number of variables are discussed under the following restrictive assumptions: (1) the differential operators possess constant coefficients (more generally, the operators possess constant principal parts), and (2) the underlying domain is a quarter space or a semi-infinite strip. (Author)

AD-282 441 Div. 15
(TISTP/TL) OTS price $1.60

Hebrew U. (Israel).
CONTRACTIONS AND THEIR QUADRATIC FORMS,
by S. R. Foguel. June 62, 11p. 7 refs. (Technical (scientific) note no. 34)
(Contract AF 61(052)187)
Unclassified report

DESCRIPTORS: *Topology, *Statistical processes, *Convex sets, Transformations, Complex numbers, Sequences, Operators (Mathematics).

AD-282 452 Div. 15
(TISTP/GRW) OTS price $1.60

Technische Hochschule, Munich (Germany).
FINITE-DIFFERENCE METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS.
Technical rept.,
by Robert Sauer. 15 June 62, 11p. 7 refs.
(Grant no. AF-EOARDC 61 - 21)
Unclassified report

DESCRIPTORS: *Partial differential equations.

Two types of finite-difference methods are studied: characteristic finite-difference methods of high accuracy for hyperbolic systems with two characteristic directions; and quasi-characteristic finite-difference methods, applicable to a wide class of systems of first order. (Author)

AD-282 512 Div. 15
(TISTP/WH) OTS price $1.10

Illinois U., Urbana.
A SLIDE RULE FOR COMPLEX NUMBERS,
by J. H. Hetherington. July 62, 7p. illus.
2 refs.
Unclassified report

DESCRIPTORS: *Complex numbers, *Nomographs, *Numerical methods and procedures.

A method for carrying out complex arithmetic which is completely analogous to the principle of the ordinary real number slide rule is described. The method results from the observation that the two basic principles of the slide rule, the equivalence of the logarithm of a product to the sum of logarithms and the addition of lengths by sliding rules, may both be extended to the complex plane. An actual device and several possible variations are discussed. (Author)

AD-282 611 Div. 15
(TISTP/TL) OTS price $4.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
CALCULATION OF PARTICULAR SOLUTIONS OF LINEAR PARTIAL DIFFERENTIAL EQUATIONS BY THE METHOD OF INTEGRAL OPERATORS,
by Stefan Bergman and John G. Herriot. 13 Aug 62, 42p. incl. tables, 10 refs. (Technical rept. no. 112 on Contract Nonr-22511; Technical rept. no. 24 on Contract Nonr-22537)
(Contract Nonr-22511, Proj. NR 041-086 and Contract Nonr-22537, Proj. NR 044-211)
Unclassified report

DESCRIPTORS: *Equations, *Partial differential equations, *Integral equations, *Operators (Mathematics), Polynomials, Complex variables.

AD-282 909 Div. 15
(TISTP/GRW) OTS price $4.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ON THE STABILITY OF CERTAIN FINITE DIFFERENCE APPROXIMATIONS TO PARABOLIC SYSTEMS OF DIFFERENTIAL EQUATIONS,
by D. G. Aronson. 17 Aug 62, 43p. 10 refs.
(Technical rept. no. 113)
(Contract Nonr-22511, Proj. NR-041-086)
Unclassified report

DESCRIPTORS: *Differential equations, Algebra, Numerical analysis, Stability, Difference equations.

Certain simple explicit finite difference approximations to the solution of the initial value problem are considered for a uniformly parabolic system of linear differential equations with variable coefficients. The problem is to determine conditions which will guarantee that the approximating difference problem is well-posed. Since explicit difference equations involving a finite number of lattice points are used, the existence of a unique solution of the difference problem is trivial. Primarily, the concern is with the dependence of the solution of the difference problem on its data. (Author)

AD-282 910 Div. 15
(TISTP/GRW) OTS price $1.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
STATIONARITY EQUATIONS IN CONTINUOUS TIME MARKOV CHAINS,
by Rupert G. Miller, Jr. 27 July 62, 18p. 14 refs. (Technical rept. no, 80)
(Contract Nonr-22552, Proj. NR-342-022)
Unclassified report

DESCRIPTORS: *Probability, Statistical processes.

AD-282 983 Div. 15
(TISTP/GRW) OTS price $1.60

RAND Corp., Santa Monica, Calif.
TWO RESULTS ON TRANSIENT MARKOV CHAINS,
by William Veech. Aug 62, 11p. 2 refs. (Research memo. no. RM-3260-PR)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: *Probability.

A necessary condition is given for solution of the equation of stationarity for transient Markov chains. A statement is included about the limiting behavior of transient chains. (Author)

AD-283 006 Div. 15
(TISTP/GRW) OTS price $3.60

Boeing Scientific Research Labs., Seattle, Wash.
NUMERICAL PROCEDURES FOR TCHEBYCHEFF APPROXIMATION,
by E. W. Cheney. June 62, 34p. incl. illus.
(Document no. D1-82-0190; Mathematical note no. 264)
Unclassified report

Also available from the author.

DESCRIPTORS: *Polynomials, *Numerical analysis.

AD-283 037 Div. 15
(TISTP/GRW) OTS price $4.60

Air Force Office of Scientific Research, Washington, D. C.
ON ESTIMATES OF LINEAR FUNCTIONALS FOR TIME SERIES,
by James Abbott, Paul Randolph, and Judah Rosenblatt. July 62, 37p. 5 refs. (Rept. no. AFOSR/DRA 62-12)
Unclassified report

DESCRIPTORS: *Statistical analysis, *Series, Functional analysis, Algebra, Velocity, Measurement.

The objective of this analysis is to establish a procedure for determining certain linear estimates of time series data. Since the immediate problem that led to this research was that of estimating velocity from position and time measurements, this analysis treats as a special case the problem of estimating velocity. Throughout, the procedures are developed within the framework of statistical decision theory. (Author)

AD-283 112 Div. 15
(TISTP/GRW) OTS price $3.60

Numerical Analysis Research, U. of Calif., Los Angeles.
SOME APPLICATIONS OF THE QUOTIENT-DIFFERENCE ALGORITHM,
by Peter Henrici. 30 June 62, 34p. 34 refs.
(Contracts Nonr-23324 and DA 04-495-ORD-1630)
Unclassified report

# Division 15 - MATHEMATICS

Presented at the Symposium on the Interactions between High-Speed Computation and Mathematical Research, Apr 18, 1962, Atlantic City, N. J.

DESCRIPTORS: *Taylor's series, *Difference equations, *Continued fractions, *Polynomials, Functions.

Quotient-Difference Algorithm is a body of mathematical knowledge that can be approached from the points of view of formal power series, difference equations, continued fractions, or orthogonal polynomials. Some applications of the algorithm are discussed in relation to the problem of locating zeros of analytic functions and to the computation of convergence factors for asymptotic expansions. (Author)

# 16. MEDICAL SCIENCES

AD-281 743 Div. 16
(TISTB/MS) OTS price $.50

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
THE INFLUENCE OF LOW AMBIENT TEMPERATURE ON COLD-ACCLIMATIZED MICE CHALLENGED WITH EHRLICH ASCITES TUMOR CELLS,
by Stanley Marcus, Fred Miya and others. Oct 61, 10p. incl. illus. table, 19 refs. (Technical rept. 61-38)
(Proj. 8241-32; In cooperation with Utah U. Coll. of Medicine, Salt Lake City)
Unclassified report

DESCRIPTORS: *Tumors, Viability, Growth, Mice, Arctic regions, Hypothermia, Climatic factors.

Ehrlich ascites tumor cells were given to mice acclimatized to low ambient temperatures. The mice were maintained at low ambient temperatures following challenge. The tumor cells were given via the intraperitoneal or subcutaneous route. The viability of the tumor cells was not affected, and the acclimatized mice showed significant delays in the mortality curves compared to the control animals kept at room temperature; however, the final mortalities were similar in the acclimatized and room temperature-exposed mice at all challenge doses employed. (Author)

AD-281 747 Div. 16
(TISTB/MS) OTS price $.50

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
EFFECT OF ACUTE AND CHRONIC LOW TEMPERATURE STRESS ON SURVIVAL OF MICE CHALLENGED WITH STAPHYLOCOCCUS AUREUS,
by Stanley Marcus, Fred Miya and others. Oct 61, 10p. incl. tables, 17 refs. (Technical rept. no. 61-42)
(Proj. 8241-32; In cooperation with Utah U. Coll. of Medicine, Salt Lake City)
Unclassified report

DESCRIPTORS: *Hypothermia, *Staphylococcus, *Stress (Physiology), Survival, Immunization, Exposure, Mice, Countermeasures.

Normal and immunized mice were subjected to acute and chronic stress of 2 C ambient temperature. The mice were challenged with varying doses of Staphylococcus aureus, strain Fritchie. Immunization offered significant protection to mice kept at 21 C and to mice that were immunized, challenged and acutely exposed to 2 C in groups. No protection was observed in mice that were immunized, challenged and exposed as individuals to 2 C. Also, immunized mice that were chronically cold exposed at 2 C were not protected against subsequent challenge and showed equivocal mortality ratios compared to the normal controls challenged under the same conditions. (Author)

AD-281 762 Div. 16
(TISTB/MS) OTS price $1.60

Nebraska U., Lincoln.
COMPARISON OF ROUTINE ROENTGENOGRAPHIC EVIDENCE WITH HISTOLOGIC EVIDENCE OF DENTAL CARIES,
by Ray M. Knapp. 31 Jan 62, 18p. incl. illus.
(Contract DA 49-007-md-1017)
Unclassified report

Original contains color plates; all ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: *Teeth, *X rays, Dental research, Histology, Reliability, Effectiveness, Dental caries, Diagnosis.

Human teeth, removed surgically, were examined for small proximal carious lesions. Applicable roentgenographs, extracted from previous completed mouth roentgenographic examinations, were procured and compared visually with thin sections cut through the lesion. The report displays Kodacolor prints of the original x-ray films and 2x, 4x, and 16x views of the sections removed from the teeth through the carious area. The photographs are displayed side by side for the examination of the reader. Although not determinable with certainty from examination of the photographs, due to poor quality control in printing procedures, good correlation was found between the lesion images on roentgenographs and the sawed sections. A supplement, pertaining to the use of certain lapidary equipment in producing ground materials, has been included. (Author)

AD-282 058 Div. 16
(TISTB/AW) OTS price $3.60

Tokugawa Inst. for Biological Research (Japan).
CHEMICAL COMPOSITION AND APPLICABILITY AS FOOD AND FEED OF MASS-CULTURED UNICELLULAR ALGAE.
Final rept. no. 2, 18 Jan 61-17 Jan 62,
by Hiroshi Tamiya. 17 Jan 62, 34p. incl. illus. tables, 11 refs.
(Contract DA 92-557-FEC-33129)
Unclassified report

DESCRIPTORS: *Algae, *Lactobacillus, Culture media, Food, Feed pellets, Acceptability, Growth, Hydrochloric acid, Peptones, Chlorophylls, Solvent extraction, Cells (Biology), Colors, Nutrition, Swine, Vitamins.

Feeding experiments were performed with pigs, rats, and mice, the first of which were the largest animals thus far tested with Chlorella-containing diets. The addition (in concentration of 2%) of freeze-dried Chlorella powder to the diet had definitely a favorable effect in promoting the growth of young pigs. The feed efficiency (weight gain in percent of the weight of feed consumed) of the Chlorella-containing diet, measured during the period of 120 days, was 23-28% compared with 17-18% shown by the control diet. Evidence that Chlorella cells contain some unknown vitamin-like substances was provided by the fact that the acid extracts and protease-digests (''peptones'') of algal material showed distinct stimulating effects upon the growth of lactic acid bacteria and other microbes. Using Lactobacillus acidophilus as test organism it was revealed that the acid extract of algal material contained at least four effective components (1) a proteinous substance, (2) arginine, (3) a peptidic substance, and (4) a nucleotide-peptide complex. (Author)

AD-282 116 Div. 16
(TISTB/AW) OTS price $2.60

6570th Aerospace Medical Research Labs., Aerospace Medical Div., Wright-Patterson Air Force Base, Ohio.
A REVIEW OF THE EFFECTS OF WEIGHTLESSNESS ON SELECTED HUMAN MOTIONS AND SENSATIONS,
by J. C. Simons and W. Kama. Apr 62, 22p. illus. 18 refs.
Unclassified report

DESCRIPTORS: *Weightlessness, *Space medicine, Motion, Sensory deprivation, Sensory perception, Maintenance, Maintenance personnel, Satellite vehicles, Motor reactions, Control, Adhesion Propulsion.

The motions of the weightless free-floating worker are discussed in terms of an operator performing maintenance and supply functions between,

upon, and within space vehicles. A postural coordinate system is used as a basic reference and current USAF studies concerned with rotating and translating the system are reviewed. Study techniques include physical analyses of the motions inflight validation of the analyses and mathematical projections of probable orbital motions. Sensations to these motions and the ability to handle inertial objects is also discussed. The motion freedom of the unencumbered surface-free worker revealed many restraint requirements and such designs as lifelines, adhesive foot-gear and self-maneuvering units are introduced to limit and control his motions. These designs are being used to determine human factor criteria for space hardware and to suggest crew selection and training procedures. The effects of transient weightlessness on sensory, psychomotor, and motor functions have revealed minor effects; however, the perception of the postural vertical and the response of the circulatory system to the return of positive gravity are considered as pertinent problems. (Author)

AD-282 150 Div. 16
(TISTB/AW) OTS price $2.60

National Academy of Sciences, Washington, D. C.
RECORDS FOLLOW-UP OF ACUTE INFECTIOUS HEPATITIS CASES TREATED DURING 1951-1952.
Final technical rept., 1 Aug 60-31 July 61,
by M. Dean Nefzger and Thomas C. Chalmers.
30 July 62, 24p. incl. tables, 20 refs.
(Contract DA 49-193-md-2130)
Unclassified report

DESCRIPTORS: *Hepatitis, *Convalescence, Therapy, Proteins, Korea.

Treatment trials conducted in Korea during 1951 and 1952 failed to show that strict bed rest was superior to ad lib bed rest in the treatment of acute infectious hepatitis or that the gradual resumption of physical activity prevented complications during convalescence. It was shown that a forced high protein diet shortened the period of acute illness by about 20 percent. To assess the long-term effects of treatment, the 460 men enrolled in these trials were followed to 30 June 1961. Similar data were obtained for 496 enlisted men who served in Korea during the period of study without admission to hospital. Mortality rates, cause of death, hospital-admission rates, hospital diagnoses, and VA disability ratings all failed to show statistically significant or consistent differences among the various original treatment regimens. The records of 96 cases with follow-up diagnoses of possible relevance to hepatitis were reviewed in detail. None contained evidence of serious chronic liver disease, 10 contained convincing clinical evidence of minimal liver disease, and 14 contained suggestive evidence of residuals. There is some evidence that infectious hepatitis occasionally may last about two years but eventually clears up completely. When all hepatitis cases were compared with the group of non-hospitalized men, the mortality rates were found almost identical. (Author)

AD-282 210 Div. 16, 30
(TISTB/AW) OTS price $2.25

Arizona U., Tucson.
STUDY AND RESEARCH ON ELECTRONIC SIMULATION OF THE BIOLOGICAL CLOCK.
Final rept.,
by Andrew P. Sage, Jr., E. Lendell Cockrum and others. May 62, 81p. incl. illus. tables, 19 refs.
(Contract AF 33(616)7677, Proj. 4160)
(ASD TDR 62-191) Unclassified report

DESCRIPTORS: *Rhythm, *Biology, Time, Animals, Light, Temperature, Analog computers, Digital computers, Sequences, Computer logic, Switching circuits, Trigger circuits, Automation, Simulation, Theory, Mathematical analysis, Periodic variations.

A general review of the literature on the biological aspects of light and temperature in relation to pacemaking is given. Both periodic and random shock effects, including the effects of periods different from twenty-four hours, frequency demultiplication, variation of intensity and duration of shocks, and multiple shocks, are described. The data are translated into a general mathematical model for the biological clock. A hybrid (digital-analog) model for the biological clock is then proposed. The electronic model consists basically of a sequential logic circuit, an analog response computer, and an activity state control. The sequential logic circuit is the basic decision mechanism which determines the changes to be made in activity state on the basis of past and present activity states and external stimuli. The analog portion of the model is used to determine the exact amount of change to be made; the activity state control represents the present activity state and receives all command inputs for state changes. (Author)

AD-282 258 Div. 16
(TISTB/AW) OTS price $11.00

Lever Bros. Co., Edgewater, N. J.
BASIC STUDIES IN PERCUTANEOUS ABSORPTION.
Semi-annual rept. no. 3, Jan-June 62,
by Leonard J. Vinson, Walter R. Koehler and others. June 62, 137p. incl. illus. tables, 14 refs.
(Contract DA 18-108-cml-6573)
Unclassified report

DESCRIPTORS: *Fatty acids, *Skin, Absorption, Diffusion, Penetration, Organic solvents, Temperature, Humidity, Water, Amines, Proteins, Electron microscopy, Rats, Laboratory animals, Alkyl radicals, Privation, Lipids.

The essential fatty acid (EFA) deficiency syndrome was related to the initial changes in function and structure of the barrier region of rats fed an EFA-free test diet. Skin recovery was also studied when the diet was supplemented with EFA. Lipid analyses of normal and deficient skins employing gas liquid and thin layer chromatography are given in detail. A fundamental study relating chemical structure and skin penetration rates of alkylamines was made. Penetration of the test material through skin was monitored by employing monoamine oxidase in the skin penetration vessel (modified Warburg) as described in previous reports. Also reported are the effects of repeated topical exposure to common solvents on skin permeability. Preliminary observations on the ultrastructure of the epidermis of both normal and EFA-deficient rats are reported. Electron micrographs depicting structural differences are presented. Studies of isolated epidermal proteins from the point of view of developing skin models to gain further insight into the nature of the skin barrier continue. Skin characterization from a physicochemical point of view is under study. Data relating to water diffusion through skin as a function of temperature and relative humidity are reported. (Author)

AD-282 360 Div. 16
(TISTB/AW) OTS price $16.50

Naval Biological Lab., U. of Calif., Berkeley.
(No title).
Technical progress rept. no. 32, 1 Jan-30 June 62,

by Stewart H. Madin. 30 June 62, 302p. incl. illus. tables, refs.
(Contracts Nonr-22273 and Nonr-22276; In cooperation with School of Public Health, U. of Calif.)
Unclassified report

DESCRIPTORS: *Aerobiology, *Bacterial aerosols, *Coccidioides, *Viruses, *Pseudomonas, Humidity, Temperature, Microorganisms, Bacteria, Metals, Bactericides, Decontamination, Low temperature research, Age, Pasteurella, Antigens, Submarines, Monitors, Epidemiology, Immunology, Influenza viruses, Neuraminic acids, Information retrieval, Naval research, Biophysics, Instrumentation, Scientific reports.

AD-282 455 Div. 16, 5
(TISTB/AW) OTS price $7.60

North American Aviation, Inc., Downey, Calif.
INTERNAL BIOLOGICAL TELEMETRY SYSTEM FEASIBILITY STUDY,
by W. Cooper. Sep 60, 70p. incl. illus. 7 refs.
(Contract AF 04(647)585)
(AFBMD TR 61-74) Unclassified report

DESCRIPTORS: *Instrumentation, *Telemetering transmitters, *Cardiotachometers, Feasibility studies, Radio transmitters, Space flight, Surgery, Physiology, Design, Space medicine, Primates.

The feasibility of transmitting heart action potentials in the form of radio waves through the intact skin of a simian during space flight conditions was investigated. Laboratory tests using instrumented simians and combined environmental test equipment show that the quality of internally obtained data is superior to that obtained simultaneously from external instrumentation. It is concluded that this means of sensing and transmitting biological data is feasible, and it is recommended that equipment capable of transmitting several physiological parameters simultaneously be developed and tested during actual space flight missions. (Author)

AD-282 468 Div. 16
(TISTB/AW) OTS price $3.60

North American Aviation, Inc., Downey, Calif.
CLOSED ECOLOGICAL SYSTEM. A LITERATURE SURVEY.
Rept. for 1958-Aug 61.
20 Nov 61, 33p. (Rept. no. SID 61-399)
Unclassified report

DESCRIPTORS: *Bibliography, *Closed-cycle ecological systems, Spaceships, Space capsules, Spaceship cabins, Nutrition, Oxygen, Water vapor, Carbon dioxide, Regeneration, Manned, Food, Water, Design, Instrumentation, Metabolic products, Respiration, Weightlessness, Algae.

The problems and experimental results of closed ecological systems are included. The period from 1958 to August 1961 is covered, with the exception of a few earlier references. The references are filed alphabetically by periodical title and corporate author in one alphabet; there are both a personal author and a subject appended to the bibliography. (Author)

AD-282 469 Div. 16, 28
(TISTB/MD) OTS price $4.60

North American Aviation, Inc., Downey, Calif.
WEIGHTLESSNESS: MAN IN SPACE. A LITERATURE SURVEY.
Rept. for 1957-Aug 61.
12 Dec 61, 38p. 131 refs. (Rept. no. SID 61-447)
Unclassified report

DESCRIPTORS: *Bibliography, *Weightlessness, Space flight, Space medicine, Laboratory animals, Man, Physiology, Psychology, Psychomotor tests.

A review of literature from 1957 to August 1961 on the state of weightlessness, with primary emphasis on the physiological aspects, is given. Some engineering documentation is included. The 131 references are listed alphabetically by periodical title and corporate author in one alphabet. Both an author and subject index follow the bibliography. (Author)

AD-282 483 Div. 16
(TISTB/CCH) OTS price $1.60

Pennsylvania Hospital, Philadelphia.
(No title).
Annual comprehensive rept.
Aug 62, 15p.
(Contract DA 18-108-cml-6652)
Unclassified report

DESCRIPTORS: *Shivering, *Tranquilizing drugs, *Nervous system, *Reserpine, Brain, Pathology, Surgery, Motor reactions, Primates, Laboratory animals.

The production of drug-induced tremor and rigidity was not successful, but it is still possible that prolonged oral administration of large doses of selected tranquilizers and reserpine may be more effective. Excellent tremor has been produced in one Rhesus monkey by a series of lesions in the mesencephalic tegmentum, and though the yield of tremor animals is low, this method still offers the greatest potentiality for studying this phenomenon experimentally. Confirmation has been obtained of the role of numerous structures within the brain, including the motor cortex, in the control of gamma motoneurone activity. Of special interest has been the observation that either excitation or inhibition is at any given time a property of all the structures stimulated, anesthetic level and the general condition of the animal being two of the factors responsible for predominance of either an excitatory or inhibitory state. Reversible cortical inactivation was most readily achieved by freezing the cortex with an ethyl chloride spray, but transient subcortical excitation during the process of freezing remains a complicating factor which requires further study. (Author)

AD-282 541 Div. 16
(TISTB/CCH) OTS price $8.60

Marseilles U. (France).
CHRONOGRAPHIC AND TOPOGRAPHIC STUDY OF CEREBRAL POTENTIALS EVOKED BY PHOTIC STIMULATION IN MAN AND IN CAT,
by H. Gastaut. 30 Apr 62, 1v. incl. illus. tables, 42 refs.
(Contract AF 61(052)20)
Unclassified report

DESCRIPTORS: *Light, *Brain, Stimulation, Electric potential, Visual perception, Electroencephlography, Histology, Physiology, Cerebral cortex.

Evoked potentials to light were studied in several areas of the brain in 5 cats during habituation, conditioning and after overtraining. The visually-evoked potential in different areas of the brain may change to a variety of situations: (1) in early habituation, it may fluctuate; later, it is reduced in amplitude. With atropine, these changes are not observed; (2) in early conditioning, it is enhanced in all

areas of the brain, but this enhancement disappears with continued training; (3) the late part of the evoked potential curve showed the earliest and most salient difference; and (4) changes under the condition described were most obvious at cortex, centre median and in the mesencephalic reticular area. (Author)

AD-282 659 Div. 16
(TISTB/AW) OTS price $1.10

Air Force Cambridge Research Labs., Bedford, Mass.
NONLINEAR OSCILLATION AND EPILEPSY,
by E. M. Dewan. June 62, 7p. incl. illus. 19 refs.
(Rept. no. AFCRL 62-392)
(Proj. 5635) Unclassified report

DESCRIPTORS: *Epilepsy, *Electroencephalography, Convulsions, Theory, Oscillation, Brain, Analysis.

A comparison is made between E.E.G. phenomena observed during epilepsy. Correspondences are shown to exist between (a) superharmonic and subharmonic entrainment and petit mal, (b) limit cycles and paroxysmal discharges, (c) oscillation hysteresis and onset of grand mal discharges, (d) van de Pol oscillation and grand mal discharge wave forms, and (e) asynchronous actions and suppression seizures. A tentative explanation of anticonvulsant drug action and certain experimental tests are proposed. (Author)

AD-282 728 Div. 16
(TISTB/AW) OTS price $2.60

Biological Labs., Frederick, Md.
PRACTICAL PROCEDURES FOR MICROBIAL DECONTAMINATION.
Report on Protective Measures for Personnel Engaged in the BW Program,
by G. Briggs Phillips, Everett Hanel, Jr., and Gardner G. Gremillion. Mar 62, 29p. incl. illus. tables (Technical manuscript no. 2)
(Proj. 4B11-05-015)
Unclassified report

DESCRIPTORS: *Decontamination, *Biological laboratories, Heat, Chemicals, Ultraviolet radiation, Microorganisms, Infections, Sewage, Buildings, Disinfectants, Bactericides, Sporicides, Viricides.

Practical procedures that are readily applicable to any infectious disease laboratory are discussed. These techniques, employing heat, chemicals (liquids and vapors), and radiation, result from experimentation and extensive use in laboratories working with a variety of infectious disease agents. (Author)

AD-282 747 Div. 16, 4
(TISTE/MD) OTS price $1.10

Chicago U., Ill.
STUDIES ON REGIONAL PENETRATION AND ACCUMULATION OF C14 PYRIDINE 2-ALDOXIME METHIODIDE (PAM) IN BRAIN.
Annual progress rept., 1 Oct 61-30 Sep 62,
by Lloyd J. Roth. 17 Aug 62, 12p.
(Grant DA-CML-18-108-G-38)
Unclassified report

DESCRIPTORS: *Pyridines, *Synthesis, *Distribution, Labeled substances, Penetration, Brain, Laboratory animals, Blood, Urine.

This report includes:
THE SYNTHESIS OF PYRIDINE-2-ALDOXIME-C14 METHIODIDE (2-PAM-C14), by Leon Clark and Lloyd J. Roth. 16 May 62.
(Grant DA-CML-18-108-61-G-8)

Pyridine-2-aldoxime-C-14 methiodide (2-PAM-C-14) was synthesized from 2-bromopyridine and potassium cyanide-C-14. Distribution of the 2-PAM-C-14 and its metabolites in the rat was determined 10 min. after a single IV injection. The concentration ratios of unmetabolized PAM in various perfused brain regions relative to the concentration in the plasma indicated that it had not only entered the extracellular space, but penetrated beyond, disproving the previously held opinion that it does not enter the C.N.S. Comparison of whole blood and plasma levels also demonstrated that it had penetrated erythrocytes. Pretreatment with the cholinesterase inhibitor dipterex enhanced the penetration of PAM into the brain. Hypercapnea produced by CO(2) pretreatment also increased the concentration in various regions of the brain. Chromatographic resolution of the urine revealed 11 distinct bands with the major portion of the activity residing in the unmetabolized 2-PAM-C-14 band. N-methyl and oxime labeled 2-PAM yielded similar results.

AD-282 771 Div. 16
(TISTB/AW) OTS price $1.60

Arizona U., Tucson.
MASKING AND SPEECH PRE-EMPHASIS.
Final rept. for 15 Dec 60-14 Dec 61 on Biological Information Handling Systems and Their Functional Analogs,
by John L. Stewart. Mar 62, 16p. incl. illus. table, 16 refs. (Rept. no. SSL-3-12/61)
(Contract AF 33(616)7800, Proj. 7233)
(MRL TDR 62-11) Unclassified report

DESCRIPTORS: *Psychoacoustics, *Speech transmission, Information theory, Intensity, Ear, Signal-to-noise ratio, Speech, Intelligibility, Mathematical analysis, Theory.

A waveform processing representation for the subjective intensity of loudness is analyzed when a mixture of signal and noise exists. Signal suppression by noise constitutes partial masking. If a spatial pattern of excitation along the basilar membrane of the inner ear is interpreted in terms of the formant structure, perferential masking of certain formants is evidenced. Emphasis of high frequency formants prevents differential masking. For noisy linear speech systems, an advantage of 4 db can be achieved by means of pre-emphasis of high frequency components with a multi-slope pre-emphasis characteristic that varies from 0 db per octave to a maximum of 8 or 9 db per octave at high frequencies. The theory of differential masking is also applied to certain peak-clipped systems in which distortion due to clipping is equivalent to masking noise. A multi-slope pre-emphasis characteristic is predicted which varies from 0 db per octave to 12 db per octave at high frequencies. In addition to pre-emphasis data, the discussion contains a theory for masking and the elements of a pattern theory for speech sound recognition. (Author)

AD-282 800 Div. 16, 8
(TISTB/CCH) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
STERILIZATION OF ELECTRONIC COMPONENTS OF SPACECRAFT,
by Joseph T. Cordaro and E. Staten Wynne. 1962, 5p. incl. illus. table, 10 refs.
Unclassified report

DESCRIPTORS: *Decontamination, *Electronic equipment, *Spaceships, *Space flight, Microorganisms, *Spores, Resistors, Diodes.

Contamination of celestial bodies with earth microorganisms might make studies of any extra-terrestrial life impossible. Sterilization of heat and/or radiation sensitive electronic components presents a special problem. Using a flexible film germ-free isolator, internal contamination was demonstrated in only 11 of 166 components, including 9 of 101 capacitors. Moreover, the level of natural contamination is low and destruction of microorganisms is assessed in terms of probability. Therefore, development of adequate sterilization procedures is being approached by deliberate contamination, during manufacture, with bacterial spores of high resistance to heat and irradiation. The results obtained with some types of resistors and diodes are presented. (Author)

AD-282 911 Div. 16
(TISTB/SJR) OTS price $2.60

Bryn Mawr Hospital, Pa.
EFFECT OF ALBUMIN, DEXTRAN AND MEAN CORPUSCULAR VOLUME ON THE RECOVERY OF RED CELLS AFTER RAPID FREEZING AND THAWING.
Progress rept. no. 52,
by Max M. Strumia. 21 Aug 62, 9p. illus. tables, 4 refs.
(Contract DA 49-193-md-2084)
Unclassified report

DESCRIPTORS: *Serum albumin, *Dextran, *Erythrocytes, *Blood transfusions, Lactose, Glucose, Plasma substitutes, Storage, Freezing, Radioactive isotopes, Anemia.

Solution of human serum albumin in a concentration of 17 to 22 g/100 ml and of dextran (M.W. 40,000) in concentration of 15 to 21 g/100 ml protect an average of 93.5% of the red cells from damage during rapid freezing and thawing. Microcytic cells under certain experimental conditions withstand the trial of rapid freezing and thawing better than normocytic cells. The molecular weight of dextran has no effect on the recovery of red cells after freezing and thawing, when used in optimal concentrations. Red cells frozen and thawed with the addition of albumin or dextran in the range of concentration noted above show poor posttransfusion survival in humans. Treatment with lactose prior to freezing with albumin, resulting in a final concentration of about 2% lactose or less, shows a very considerable improvement in the in vivo survival. (Author)

AD-282 913 Div. 16
(TISTB/AW) OTS price $3.60

Biotechnology Lab., U. of Calif., Los Angeles.
ARM PROSTHESIS RESEARCH. HUMAN TRACKING. CONTROL LOGIC FOR A MYOELECTRIC SERVO-BOOST SYSTEM.
Progress rept.,
by John Lyman. 15 June 62, 24p. incl. table.
(Engineering Dept. rept. no. 62-31)
(Contracts N123(60530)23558A and V1005M-2075)
Unclassified report

DESCRIPTORS: *Prosthetics, *Artificial limbs, *Joints (Physiology), Control, Muscles, Surgery, Transducers, Hands, Servomechanisms, Arms, Electrical equipment, Mechanical properties.

Contents:
Fundamental studies to establish body control sites for application to externally-powered prostheses
Component development studies
Control engineering survey
Analysis of existing externally-powered prostheses and development of advanced design specifications
Development of electro-pneumatic lock-and-lift system
Socket fit studies
Stump thermal effects study
Selected application studies

AD-282 938 Div. 16
(TISTB/SJR) OTS price $1.75

Isomet Corp., Palisades Park, N. J.
STUDY OF ELECTROLYTIC REDUCTION OF CARBON DIOXIDE.
Rept. for 1 Oct 60-30 Sep 61 on Equipment for Life Support in Aerospace,
by Horace W. Chandler and Willem Oser. Mar 62, 53p. incl. illus.
(Contract AF 33(616)7349, Proj. 6373)
(MRL TDR 62-16) Unclassified report

DESCRIPTORS: *Closed-cycle ecological systems, *Carbon dioxide, Decomposition, Reduction, Electrolysis, Electrolytic cells, Oxygen, Production, Space capsules, Space medicine, Electrolytes, Carbonates, Oxides, Lithium compounds, Potassium compounds, Sodium compounds, Lanthanum compounds, Lattices, Thorium compounds, Yttrium compounds, Solid state physics.

Electrolytic methods for regeneration of oxygen from carbon dioxide were studied to design a closed-cycle life support system. Two different electrolyte systems were studied: molten alkali carbonates and solid oxides. Mixtures of lithium and potassium carbonates were suitable and could be operated in two different fashions. If operated below the decomposition voltage of the alkali carbonates, the decomposition of the carbon dioxide was direct while operation above the decomposition potential involved the intermediate formation of alkali metals and subsequent reduction of the carbon dioxide with the alkali metal. Using solid mixed oxides of thorium with either yttrium or lanthanum as the electrolyte was feasible because of migration of oxygen ions by means of vacancies existing in the anionic lattice. Cells operate in the temperature range from 400 to 900 C and gas chromatographic analyses have demonstrated the production of oxygen from carbon dioxide. (Author)

AD-282 962 Div. 16
(TISTB/CCH) OTS price $2.60

Springfield Coll., Mass.
ELECTROGONIOMETRY: NORMAL AND PATHOLOGICAL LOCOMOTION CLINICAL APPLICATION,
by Charles M. Tipton and Peter V. Karpovich.
20 Aug 62, 11p. illus. table, 1 ref.
(Contract DA 49-007-md-889)
Unclassified report

DESCRIPTORS: *Goniometers, *Motion, *Legs, Therapy, Physiology, Pathology, Measurement.

An analysis was made of the action of the knee and ankle joints while walking up and down a 20 degree incline, and a comparison was made with the records obtained during walking on the horizontal plane. Records were also made for walking backwards on the horizontal and on grades of +20 and -20 degrees. Consideration is given to the clinical application of electrogoniometry for recording patterns of movement associated with disease and injuries. Elgons also were used to record changes occurring after a period of treatment or during the application of various physiotherapeutic modalities. It was concluded that electrogoniometry represents a useful adjunct for diagnostic records,

and for objective evaluation of progress obtained during treatment, and that it may be used for obtaining objective evidence of the outcome of a surgical operation.

AD-282 974 Div. 16
(TISTB/SJR) OTS price $3.60

Quartermaster Food and Container Inst. for the Armed Forces, Chicago, Ill.
MODIFIED MICROBIOLOGICAL PROCEDURES FOR VITAMIN ASSAYS. A MANUAL.
Interim rept.,
by Miriam H. Thomas. July 62, 36p. (QMFCIAF rept. no. 19-62)
Unclassified report

DESCRIPTORS: *Vitamins, Biotin, Folic acid, Nicotinic acid, Riboflavin, Biochemical tests.

This manual includes modified microbiological procedures for vitamin assays for biotin, folic acid, pantothenic acid, niacin, and riboflavin. The basis for the procedures presented herein is Methods of Vitamin Assay, Assn. Vit. Chem., 2nd Ed. Interscience Publishers, Inc., 1951. (Author)

AD-282 984 Div. 16, 10
(TISTB/CCH) OTS price $2.75

Texas A. and M. Coll., College Station.
ENVIRONMENTAL POLLUTION BY MISSILE PROPELLANTS.
Final rept. for Feb-Nov 61 on Toxic Hazards of Propellants and Materials,
by Walter W. Heck, Luther S. Bird and others.
Apr 62, 112p. incl. illus. tables, 44 refs.
(Rept. no. RF-280)
(Contract AF 33(616)7801, Proj. 6302)
(MRL TDR 62-38) Unclassified report

DESCRIPTORS: *Atmosphere, *Propellants, Marine biology, Bacteria, Fungi, Plants, Soils, Daphnia, Contamination.

The effects of 21 missile fuel components, in concentrations of 0, 1, 10, 100, and 1000 ppm, were determined on aquatic organisms (goldfish and Daphnia) soil microflora (bacteria, actinomycetes, and fungi), plants (squash, soybean, cotton, cowpea, and corn) and soils (leachability, runoff, and structure). Some or all of the aquatic organisms died when exposed to 100 ppm of the test chemicals. The same concentration of chemicals had no effect on the counts of soil microflora. Three of the test samples may sterilize the soil of actinomycetes. A concentration of 1000 ppm of two of the compounds and two ionic species produced inhibition of seeding germination. Three of the ionic components, when used as a soil drench at 100 ppm, produced toxic symptoms. When three of the test chemicals (gases) were used at 100 ppm as air pollutants, severe injury or death occurred in all species. Soil analyses were erratic and indicated further research on this problem. Future studies should include the concentration-time relationship of the toxic materials and the absorptive capacities of soil fractions for the test compounds. (Author)

AD-283 001 Div. 16
(TISTB/CCH) OTS price $2.60

Science and Tech. Branch, Aerospace Information Div., Washington, D. C.
SOVIET LITERATURE ON LIFE SUPPORT SYSTEMS. A. BIOSCIENCES,
Monthly rept. no. 12 for June 62,
8 Aug 62, 19p. incl. illus. tables, 8 refs.
(AID rept. no. 62-110) Unclassified report

DESCRIPTORS: *Literature, *Radiobiology, *Space medicine, Space flight, Immunization, Biology, Blood, Biochemical tests, USSR.

A monthly report series reviewing Soviet developments in life support systems as reflected in Soviet publications is presented. It is based on materials made available at the Aerospace Information Division through June 1962. Items are selected from Soviet open literature, including both scientific and popular publications. This report deals with space medicine and biology, and space physiology. (Author)

AD-283 004 Div. 16
(TISTB/CCH) OTS price $1.10

Science and Tech. Branch, Aerospace Information Div., Washington, D. C.
SOVIET LITERATURE ON LIFE SUPPORT SYSTEMS. ECIAL REPORT ON ALGAE,
by G. K. Barashkov. 1 Aug 62, 7p. incl. illus.
(AID rept. no. 62-115)
Unclassified report

DESCRIPTORS: *Algae, Space flight, Space medicine, Biochemistry, Biosynthesis, Saccharides, Lipids, Nitrogen compounds, Plant pigments, Glucosides, Polymerization, USSR.

Contents:
Space report on algae
Chemistry of diatoms
Nutritional value of diatoms
Chemistry of blue-green algae
The First All-Union Scientific and Technical Conference on the Algae Industry

AD-283 005 Div. 16
(TISTB/CCH) OTS price $4.60

Science and Tech. Branch, Aerospace Information Div., Washington, D. C.
SOVIET LITERATURE ON LIFE SUPPORT SYSTEMS. A. BIOSCIENCES.
Monthly rept. no. 11 for May 62,
31 May 62, 41p. incl. illus. tables, 9 refs.
(AID rept. no. 62-91)
Unclassified report

DESCRIPTORS: *Space medicine, *Physiology, *Radiobiology, *Biology, Telemetering data, Test methods, Closed-cycle ecological systems.

A monthly report series reviewing Soviet developments in life support systems as reflected in Soviet publications is presented. This report is based on materials made available at the Aerospace Information Division during May 1962. Items are selected from Soviet open literature and include scientific publications and literature of a popular type. The materials deal with space medicine and biology, space physiology, and space vehicle ecology. (Author)

AD-283 100 Div. 16
(TISTB/CCH) OTS price $1.50

Michigan U., Ann Arbor.
TRANSMISSION OF THE OCULAR MEDIA.
Rept. for 1 Dec 59-1 Dec 61, on Aerospace Systems Personnel Protection,
by E. A. Boettner and J. R. Wolter. May 62, 43p. incl. illus. tables, 7 refs.
(Contract AF 33(616)6847, Proj. 6301)
(MRL TDR 62-34) Unclassified report

DESCRIPTORS: *Eye, *Light transmission, Ultraviolet radiation, Infrared radiation.

The spectral transmittance of ultraviolet, visible, and near infrared light through the ocular media of humans has been measured. Using

freshly enucleated eyes, the transmittances of each component part (cornea, aqueous humor, lens, vitreous humor) were determined for the wavelength range from 0.22 to 2.8 microns. To date 9 eyes have been measured, ranging in age from 4 weeks to 75 years. Two types of measurements were made: the first to measure the total light transmitted (direct and scattered) at each wavelength and the second to measure the percent transmittance of that light passing directly through the various media without absorption or scattering. The results show that: (a) the transmission of ultraviolet radiation decreases with the age of the eye; (b) the transmission of infrared radiation appears to be independent of the age; and (c) the maximum total transmittance of the whole eye, about 81 percent, is obtained in the region from 600 to 850 millimicrons. (Author)

## 17. METALLURGY

AD-281 712 Div. 17
(TISTM/AW) OTS price $1.75

Armour Research Foundation, Chicago, Ill.
RESEARCH ON THE BASIC NATURE OF STRESS CORROSION FOR VARIOUS STRUCTURAL ALLOYS AT ROOM AND ELEVATED TEMPERATURE.
Final rept., 15 Oct 60-14 Dec 61 on Metallic Materials,
by Frank A. Crossley. May 62, 61p. incl. illus. tables (Rept. no. ARF 2206-6)
(Contract AF 33(616)7612, Proj. 7351)
(ASD TR 61-713) Unclassified report

DESCRIPTORS: *Corrosion, *Alloys, *Titanium alloys, *Aluminum alloys, *Stainless steel, *Magnesium alloys, Chlorides, Sodium compounds, Salts, Water, Stresses, Films, Tensile properties, Surfaces, Failure (Mechanics), Microstructure, Ions, Aircraft, Materials, Fracture (Mechanics), Sheets, Grains (Metallurgy), Temperature.

The relationship between quantity of ASTM sea salt, varying from 0.0002 to 0.02 g/sq in., and thickness of anodized film--0, 2, and 8 microinches--in elevated temperature stress-corrosion cracking of the titanium alloys Ti-6A1-4V and B120VCA was investigated. Exposure conditions were 800 degrees F-25,000 psi-190 hr for the former alloy and 600 degrees F-100,000 psi-190 hr for the latter. Damage was progressively greater with increasing quantity of salt. The anodized films appeared to be of benefit only to the B-120VCA. The alloys: 2024-T86, 7075-T6, ZK-60A-T5, 17-7 PH RH950, and B-120VCA in two conditions of grain size and two conditions of surface treatment were tested as follows: tensile test in air at room temperature, and in distilled water and ASTM sea water at 32 degrees, 75 degrees, and 212 degrees F; and statically loaded at 90% of the yield strength in media of air, water, and ASTM sea water at room temperature.

AD-281 715 Div. 17, 27
(TISTM/EJH) OTS price $8.60

Ingersoll Kalamazoo Div., Borg-Warner Corp., Mich.
THE EFFECT OF SURFACE DECARBURIZATION OF THE NOTCH SENSITIVITY OF MBMC #1, SUPER TRICENT AND AISI 9262 STEELS.
by E. S. Mills. 15 July 62, 88p. incl. illus. tables (Proj. rept. no. SPDIR-26)
(Contract NOrd-15719)
Unclassified report

DESCRIPTORS: *Steel, *Rocket cases, Surfaces, Carbon, Mechanical properties, Tensile properties, Corrosion, Stresses, Austenite, Pressure vessels, High temperature research, Heat treatment, Processing, Microstructure, Hardness, Test methods, Surface properties.

The results of a laboratory study of the effect of surface decarburization on the yield strength and notch toughness parameters of three high strength steels: MBMC No. 1, Super Tricent and AISI 9262 are presented in graphical and tubular form. Curves of depth of surface decarburization versus yield strength and notch toughness as indicated by critical Griffith strain energy release rate for unstable crack propagation are presented for each material for nominal thickness of 0.050 in., 0.100 in. and 0.150 in. It is shown that the yield strength and notch toughness of each material is a straight line function of depth of surface decarburization in that increasing depth results in increasing notch toughness and decreasing yield strength. Limited information on the effect of surface decarburization on the stress corrosion resistance of MBMC No. 1 and Super Tricent steels as compared to that of the non-decarburized or base metal is also presented. (Author)

AD-281 728 Div. 17, 26
(TISTM/EJH) OTS price $1.60

Climax Molybdenum Co. of Michigan, Detroit.
THE DEVELOPMENT AND EVALUATION OF TUNGSTEN-BASE ALLOYS.
Quarterly rept. no. 1, 15 Mar-15 June 62,
by Gordon D. McArdle, Robert Q. Barr, and M. Semchyshen. 15 June 62, 17p. incl. illus. tables.
(Contract NOw 62-0419-c)
Unclassified report

DESCRIPTORS: *Tungsten alloys, *Heat resistant alloys, Niobium alloys, Molybdenum alloys, Hafnium alloys, Zirconium alloys, Alloys, Casting, Extrusion, Fracture (Mechanics), Hardness, High temperature research, Processing, Tungsten alloys.

Binary W-base alloys containing small additions of Nb, Hf, or Zr, and ternary W-base alloys containing additions of Mo with Hf or Zr were consolidated by the vacuum-arc-casting process. Metallographic studies and hot-hardness determinations are reported. Machined blanks from each heat were extruded to round billet form at temperatures from 3000 to 4260 F. Preliminary indications are that extrusion recoveries will be low. In general, bars extruded at high temperatures contained relatively deep surface ruptures, while those extruded at low temperatures contained internal cracks. (Author)

AD-281 769 Div. 17, 14
(TISTM/REB) OTS price $1.10

Raytheon Co., Waltham, Mass.
HIGH TEMPERATURE MATERIALS DEVELOPMENT.
Monthly progress rept. no. 30 for June 62.
15 July 62, 5p. illus. (Rept. no. S-477)
(Contract NOrd-19135)
Unclassified report

DESCRIPTORS: *Refractory materials, *Graphite, *Zirconium alloys, *Heat resistant alloys, Production, Pyrolysis, Microstructure, Mechanical properties.

Flexural strength on the order of steel was found with the Zr-Pyrographite alloy even for delaminated material. New techniques were developed to overcome feed line plugging and vacuum difficulties in producing high strength

zirconium alloy Pyrographite. The microstructure of the carbon-carbide material is unlike either parent substance and exhibits striations rather than cones or grains. (Author)

AD-281 790 Div. 17, 25
(TISTM/TCG) OTS price $1.60

Watertown Arsenal Labs., Mass.
THE DEBYE TEMPERATURE OF IRON-MANGANESE SOLID SOLUTION ALLOYS,
by Charles P. Gazzara and Raymond M. Middleton. July 62, 10p. incl. illus. 21 refs. (Technical rept. no. WAL TR 811.2/2)
Unclassified report

DESCRIPTORS: *Alloys, *Iron alloys, *Manganese alloys, Temperature, Measurement, X-ray diffraction analysis, Test methods, Solids, Solutions, Heat treatment, Thermodynamics, Solid state physics, Physical properties.

The Debye characteristic temperatures of Fe-Mn solid solution alloys were determined between 98 and 310 K using an X-ray diffraction technique. The diffracted peak integrated intensities were corrected for temperature diffuse scattering, dispersion and volume change of the specimen with temperature. (Author)

AD-281 801 Div. 17
(TISTM/EJH) OTS price $3.60

General Dynamics/Fort Worth, Tex.
RELATIONSHIP OF HOT HARDNESS TO ELEVATED TEMPERATURE MECHANICAL PROPERTIES,
by S. V. Glorioso. 23 Dec 60. 27p. incl. illus. tables, 5 refs. (Rept. no. ERR-FW-054)
(Contract AF 33(657)7248)
Unclassified report

DESCRIPTORS: *Heat resistant alloys, *Corrosion resistant alloys, *Nickel alloys, *Stainless steel, *Hardness, Creep, Tensile properties, High temperature research, Test methods, Chromium alloys, Cobalt alloys, Steel.

A method is described by which tensile and long time creep properties may be correlated to hot hardness. The procedure was used on PH15-7MO - RH950 and Rene' 41. The tensile and creep rupture properties were plotted against the time. Temperature parameter P = T (C + log t) with values for the constant C of 18 or 20 and where T is the absolute temperature in R degrees and T is a measure of the test time in hrs. A similar plot or hardness was made against the parameter P. Cross plotting the curves obtained yielded a straight line, which indicated the existence of a valid correlation. (Author)

AD-281 811 Div. 17, 14, 25
(TISTM/EJH) OTS price $2.00

Syracuse U. Research Inst., N. Y.
THE EFFECT OF STRESS GRADIENT AND STRESS BIAXIALITY ON THE BEHAVIOR OF MATERIALS.
Final rept., 15 Oct 60-15 Oct 61 on Refractory Inorganic Non-Metallic Materials,
by Volker Weiss, John Sessler and Kushwant Grewal. May 62, 65p. incl. illus. tables, 13 refs.
(Contract AF 33(616)7609, Proj. 7350)
(ASD TR 61-725) Unclassified report

DESCRIPTORS: *Brittle materials, *Metals, *Titanium alloys, *Ceramic materials, *Stresses, *Steel, Alloys, Aluminum alloys, Vanadium alloys, Mechanical properties, Tensile properties, Theory.

Effects of stress gradient and stress biaxiality on the notch strength of brittle, semi-brittle and semi-ductile materials were investigated. Results obtained on a nearly ideally brittle titanium alloy are in agreement with the predictions of a fracture concept based on Neuber's theory of notch stresses. Accordingly the stress concentration factor is the dominant parameter. The magnitude of the stress gradient and stress biaxiality at the notch root has a secondary effect in that the notch strength of brittle materials is reduced with decreasing gradient and increasing biaxiality. The notch strength behavior of brittle ceramics has to be interpreted in terms of the inhomogeneity of these materials. Weibull's statistical theory of fracture was applied to this problem. Semi-brittle and semi-ductile materials exhibit a behavior similar in trend to that predicted for brittle materials with respect to stress concentration factor, stress gradient and stress biaxiality. However, for low stress concentration factor values, these effects are altered by phenomena due to plastic deformation at and near the notch root which significantly modify the stress and strain distribution and cause notch strengthening, the amount of which in itself appears related to the stress gradient and the stress biaxiality. (Author)

AD-281 849 Div. 17, 25
(TISTM/GEC) OTS price $1.10

Stanford U., Calif.
OBSERVATIONS OF THE ELECTRICAL RESISTIVITY OF AN INTERNALLY OXIDIZED SILVER-MAGNESIUM ALLOY,
by Mark J. Klein and Robert A. Huggins. Oct 61, 8p. incl. illus. table, 9 refs. (Technical rept. no. 5; DMS rept. no. 61-14)
(Contract Nonr-22534, Proj. NR 031-577)
Unclassified report

DESCRIPTORS: *Silver alloys, *Magnesium compounds, *Magnesium alloys, Electrical properties, Resistance, Oxidation, Deformation, Heat treatment, Solids, Solutions, Oxides.

Several investigators have reported that internal oxidation of dilute alloys is accompanied by significant changes in electrical resistivity. In addition, the resistivity of materials containing dispersions has been shown to increase rapidly upon plastic deformation. This note reports a number of oxidation, deformation, and annealing experiments made on the Ag - MgO alloy and to briefly discuss possible causes of the observed effects. (Author)

AD-281 854 Div. 17, 25
(TISTM/EJH) OTS price $5.60

Columbia U., New York.
RESEARCH AND DEVELOPMENT WITH RESPECT TO HEAT TRANSFER IN QUENCHING.
Final rept., 16 Dec 55-15 Dec 61,
by V. Paschkis and George Stolz, Jr. July 62, 53p. incl. illus. 23 refs.
(Contract DA 30-069-ORD-1612, Proj. 599-1-004)
(AROD rept. no. 1540:6)
Unclassified report

DESCRIPTORS: *Steel, *Silver, *Heat transfer, *Cooling, Thermodynamics, Processing, Boiling, Film boiling, Nucleate boiling, Temperature, Surfaces, Silver plating, Test equipment, Thermocouples, Oscillograms, Metals.

The determination of heat transfer coefficients of steel and Ag from experiments under controlled conditions and the correlation and generalization of the experimental results are discussed. Samples were heated and quenched under controlled conditions. Thermocouples were used to record the temperatures at several points in the sample on an oscillograph. The galvanometer traces

were read out on a specially constructed oscillogram reader. From these cooling curves, surface heat flux and surface temperature were computed as function of time. Numerical techniques developed for this purpose and programmed for a digital computer were employed. Results are reported as heat flux or heat transfer coefficient vs. surface temperature. (Author)

AD-281 874 Div. 17
(TISTM/MS) OTS price $2.60

Belfour Engineering Co., Suttons Bay, Mich.
FATIGUE OF METALS, ALUMINUM. PART I.
Rept. on Mechanical Properties Information Processing System.
Aug 61, 16p. incl. illus. 8 refs.
(Contract AF 33(616)7238, Proj. 7381)
(ASD TN 61-117, pt. 1)
Unclassified report

DESCRIPTORS: *Aluminum, *Aluminum alloys, Tensile properties, Mechanical properties, Data, Alloys, Metals, Sheets, Metal plates, Rods, Tables, Fatigue (Mechanics).

The graphs presented display metals fatigue information from various sources of published and unpublished test data which has been processed and regenerated through a semi-automatic data processing system. Each series or set of graphs contain descriptive information (legends) which identifies the material, test procedure, test conditions and the most significant test and/or material variables associated with the plotted data. The data displayed in each set of graphs is intended to answer very general 'questions' and to serve as a guide to further investigation of specific areas within the subject presented. (Author)

AD-281 881 Div. 17, 27, 12
(TISTM/MS) OTS price $10.10

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
STRESS CORROSION OF HIGH STRENGTH STEELS AND ALLOYS; ARTIFICIAL ENVIRONMENT,
Final rept., 1 July 60-30 June 62,
by C. J. Owen. 30 June 62, 110p. incl. illus. tables.
(Contract DA 36-034-ORD-3277)
Unclassified report

DESCRIPTORS: *Rocket cases, *Corrosion resistant alloys, *Steel, Stainless steel, Corrosion, Corrosion inhibition, Corrosive gases, Corrosive liquids, Mechanical properties, Physical properties, Stresses, Failure (Mechanics), Heat treatment, Sheets, Molybdenum alloys, Nickel alloys, Cobalt alloys, Chromium alloys, Uranium alloys, Test methods, Corrosion research, Organic coatings, Titanium alloys.

A study of the susceptibility of various high strength missile materials to stress corrosion cracking in a number of synthetic environments was performed. In general, all low alloy martensitic steels showed a susceptibility to stress corrosion failure in varying degree, D6Ac being the least susceptible and Vascojet 1000 being the most susceptible. Of the higher alloy samples, AM355 and Ardeform 301 showed a possible susceptibility in the synthetic chloride environment. The PH15-7Mo and B120VCA were not prone to stress corrosion failure. A decarburized surface decreased failure rate in U-bends by several orders of magnitude and alloying with uranium effected a U-bend failure rate decrease of well over one order of magnitude. In general, organic coatings were not too effective in inhibiting stress corrosion failure, one or two coatings being somewhat superior to the others. The more promising combinations of coating variables are indicated. (Author)

AD-281 882 Div. 17, 4
(TISTM/MS) OTS price $1.60

Central Inst. for Industrial Research (Norway).
RESEARCH ON THE BEHAVIOUR OF TANTALUM AND TANTALUM BASE ALLOYS AT HIGH TEMPERATURES.
Final technical rept., 1 Apr 61-31 Mar 62,
by Per Kofstad. 1 Apr 62, 11p. (Grant AF-EOAR-61-42)
(ARL 62-397) Unclassified report

DESCRIPTORS: *Tantalum, *Tantalum alloys, *Niobium, Niobium alloys, Oxidation, Reaction kinetics, Oxides, Oxygen, Tantalum compounds, Electron diffraction analysis, Microstructure, Electron microscopy, Metallurgical analysis, Tungsten, Hardness, Lattices, Phase studies, High temperature research.

The report summarizes research studies of the oxidation behaviour of tantalum at 300-500 C (TN No. 3), X-ray diffraction and metallographic investigations of metallic oxide phases (suboxides) of tantalum and niobium, which are reaction products in the oxidation of these metals (TN Nos. 1 and 2), and studies of oxidation of Ta-10% at 700-1300 C (TN No. 4). (Author)

AD-281 888 Div. 17
(TISTM/EJH) OTS price $1.50

Defense Metals Information Center, Columbus, Ohio.
PROPERTIES OF MAR-AGING STEELS,
by D. C. Drennen and D. B. Roach. 2 July 62,
51p. incl. tables (DMIC memo. no. 156)
(Contract AF 33(616)7747, Proj. 2(8-8975))
Unclassified report

DESCRIPTORS: *Steel, *Heat resistant alloys, *Nickel alloys, *Stainless steel, Martensite, Tensile properties, Processing, Heat treatment, Welding, Corrosion, Hardening, Cobalt alloys, High temperature research, Low temperature research, Molybdenum alloys, Rocket cases, Pressure vessels, Aging, Mechanical properties.

Contents:
Metallurgical considerations
Production characteristics
Properties of Mar-aging steels
25 Ni steel
20 Ni steel
18 Ni Co Mo steel (250)
18 Ni Co Mo (300) steel

AD-281 894 Div. 17
(TISTM/EJH) OTS price $4.60

Massachusetts Inst. of Tech., Cambridge.
THE STRENGTH OF MARTENSITE,
by P. G. Winchell and Morris Cohen. 1 Mar 62,
33p. illus. 25 refs. (Technical rept. no. 6)
(Contract Nonr-184135)
Unclassified report

DESCRIPTORS: *Steel, *Martensite, Phase studies, Phase transitions, Carbon, Solutions, Solids, Austenite, Aging, Lattices, Iron alloys, Nickel alloys, Carbon alloys, Atoms, Crystal structure, Hardening.

Fe-Ni-C alloys were selected to determine the role of C in the strengthening of virgin (untempered) martensite. Martensites formed at subzero temperatures were maintained at low-temperature levels for the studies. The axial ratio of the tetragonal lattice increased with

the C concentration, but there was an extra tetragonality independent of C and which is thought to result from the presence of stacking faults. The extra tetragonality disappeared on aging above room temperature where the regular tempering reactions occur. The C-dependent strengthening of virgin martensite can be described as a solid-solution hardening phenomenon. The fine structure of the martensite is thought to be a contributory factor in the over-all strengthening. In addition, at temperatures above about -60 C, age hardening due to carbide precipitation provides a further component of strengthening which increases with the carbon content; this increment is relatively small compared to the solid-solution effect. (Author)

AD-281 895 Div. 17
(TISTM/EJH) OTS price $7.60

Massachusetts Inst. of Tech., Cambridge.
THE 1962 HOWE MEMORIAL LECTURE ON THE STRENGTHENING OF STEEL,
by Morris Cohen. 1 Apr 62, 48p. illus. 45 refs.
(Technical rept. no. 7)
(Contract Nonr-184135)
Unclassified report

DESCRIPTORS: *Steel, *Martensite, Phase studies, Phase transitions, Crystal structure, Lattices, Atoms, Carbon, Nickel alloys, Mechanical properties, Theory, Iron alloys, Carbon alloys, Hardening.

The strength of martensite in hardened steels seems to be due basically to solid-solution hardening contributed by the carbon atoms occupying interstitial sites in the body-centered lattice of iron. The severe local and nonsymmetrical displacements of the neighboring iron atoms produce dipole distortions that interact strongly with dislocations. The observed magnitude of such solid-solution hardening requires that the effective dislocation length be of the order of 100 angstroms. This distance is identified with the fine-scale twin spacing which is actually found in the Fe-Ni-C martensites studied. These hardening features are especially clear in Fe-Ni-C martensites because the latter can be formed and tested at subzero temperatures where C-diffusion processes are not operative. In the conventional hardening of steel by quenching to room temperature, or in the room-temperature aging of refrigerated martensite, C-precipitation hardening sets in and furnishes a further increment of strength which is subject to considerable manipulation by thermal and mechanical treatments. (Author)

AD-281 905 Div. 17, 14
(TISTM/REB) OTS price $5.60

Snell, Foster D., Inc., New York.
DEVELOPMENT OF ULTRA-THIN FILM PRESERVATIVE COMPOUNDS.
Final rept., 6 June 61-5 July 62,
by William Miglas and Bernard Berkeley.
20 July 62, 47p. incl. illus. tables.
(Contract NOw 61-0855-c)
Unclassified report

DESCRIPTORS: *Corrosion inhibition, *Thin films, *Coatings, *Humidity cabinets, Corrosion, Metals, Alloys, Tests, Test equipment, Design, Friction, Effectiveness, Thickness, Measurement.

Candidate materials were tested in a controlled cyclic condensation humidity cabinet. Several of these materials meet the corrosion preventive requirements of an ultra-thin film preservative compound. Three of these were tested with the Falex Lubricant Testing Machine for effect on wear properties of a typical lubricant. Alox 2028 (a mixture of organic acids, oxyacids and esters derived from oxidation of petroleum hydrocarbons) appears to be the most satisfactory material tested. A controlled cyclic condensation humidity cabinet was used as the corrosion test cabinet. (Author)

AD-281 913 Div. 17
(TISTM/MS) OTS price $1.60

Armour Research Foundation, Chicago, Ill.
DEVELOPMENT AND APPLICATION OF A THEORY FOR PLASTIC DEFORMATION OF CEMENTED ALLOYS. TASK 3. COPPER-COOLED TUNGSTEN FIBER ROCKET NOZZLE MATERIALS.
Quarterly rept. no. 2, 1 Oct-31 Dec 61,
by T. J. Koppenaal. 29 Jan 62, 8p. incl. illus. table.
(Contract DA 11-022-505-ORD-3092, Proj. TB4-002)
(WAL TR 372/32-3-T3)
Unclassified report

DESCRIPTORS: *Rocket motor nozzles, *Alloys, *Powder alloys, Silicon alloys, Nickel alloys, Copper alloys, Tungsten wire, Reinforcing materials, Deformation, Materials, Theory, Cooling, Thermal insulation, Fibers, Bonding, Density, Metallic textiles, Microstructure, Tensile properties, Sintering, Manufacturing methods, Insulating materials, Heat resistant alloys, Tungsten, Design, Mechanical properties, Physical properties.

The copper-nickel ratio used as a matrix material has been investigated in 75% density tungsten fiber composites made from one and two mil diameter fibers. The ductility in tension and compression was evaluated. The use of Si as an additive to the matrix was examined in an attempt to improve the ductility in tension. Future work with Al and Ti additions are planned. (Author)

AD-282 001 Div. 17
(TISTM/GEC) OTS price $.50

Directorate of Materials and Processes, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
CALCULATION OF STACKING FAULT ENERGIES FOR FACE-CENTERED CUBIC METALS.
Final rept., Jan-Mar 62 on Characterization of Solid Phase and Interphase Phenomena in Crystalline Substances,
by Harold L. Gegel. May 62, 10p. incl. illus. tables, 14 refs.
(Proj. 7353)
(ASD TDR 62-388) Unclassified report

DESCRIPTORS: *Metallic crystals, Growth, Deformation, Phase studies, Theory, Mathematical analysis, Energy, Metals, Lattices, Crystal structure.

A theoretical investigation was undertaken to determine the stacking fault energy for face-centered cubic metals. An expression was derived which relates the Debye characteristic temperature of the metal and the absolute temperature to the stacking fault energy. An Einstein oscillator was used as a model for the derivation. (Author)

AD-282 003 Div. 17, 14
(TISTM/GEC) OTS price $3.00

Aeronca Mfg. Corp., Middletown, Ohio.
BERYLLIUM COMPOSITE STRUCTURES. VOLUME I. DESIGN AND APPLICATION.
Final technical engineering rept., 4 Feb 60-31 Aug 61 on Design Technologies and Structural Configuration Concepts for Aerospace Vehicles,

by J. N. Krusos, A. S. Kjelby and others.
May 62, 169p. incl. illus. tables, 44 refs.
(Rept. no. ER-532)
(Contract AF 33(616)7050, Proj. 1368)
(ASD TR 61-706, vol. 1) Unclassified report

DESCRIPTORS: *Beryllium, *Composite structures, *Airframes, Ceramic materials, Aluminum compounds, Silicon compounds, Zirconium compounds, Oxides, Dioxides, High temperature research, Foams, Thermal insulation, Design, Shielding, Tests, Turbojet engines, Ramjet engines, Exhaust gases, Sandwich panels, Sheets, Metal plates, Re-entry vehicles.

Design information is presented for Be and ceramic composite structures for re-entry vehicle applications. A summary of materials and process developments for Be panels and heat shield ceramics, analytical evaluations, and discussion of application of insulated structural concepts to re-entry vehicle systems are included. Also included are the results of panel tests in the severe environments of turbojet and ramjet exhausts. Data suitable for preliminary design considerations are presented for three reinforced heat shield ceramic foams: $Al_2O_3$, $SiO_2$, and $ZrO_2$. Be sandwich panels constructed in the course of the program are described with regard to fabrication potential and performance in aerospace structures. (Author)

AD-282 022 Div. 17, 14
(TISTM/GEC) OTS price $4.60

Marquardt Corp., Van Nuys, Calif.
CALENDAR YEAR 1962 AIR FORCE-MARQUARDT CONTRIBUTING ENGINEERING PROGRAM. VOLUME II.
Quarterly progress rept. no. 2, vol. 2, 1 Apr-30 June 62.
31 July 62, 40p. incl. illus. tables, refs.
(Rept. no. 25,054, vol. 2)
(Contract AF 33(600)40809)
Unclassified report

DESCRIPTORS: *Refractory materials, *Oxidation inhibitors, Coatings, High temperature research, Processing, Welding, Brazing, Electron beams, Deformation, Microstructure, Welded joints, Sheets, Tantalum alloys, Tungsten alloys, Mechanical properties, Thickness, Silicon compounds, Carbides, Welding rods, Tests, Refractory coatings, Manufacturing methods.

Research is reported on refractory metals fabrication and coatings, and high temperature materials research. (Author)

AD-282 025 Div. 17, 25
(TISTP/JW) OTS price $1.60

Brown U., Providence, R. I.
ANELASTICITY CAUSED BY DEBRIS DIPOLES IN PLASTICALLY STRAINED CRYSTALS,
by J. J. Gilman. July 62, 10p. illus. table, 16 refs. (Technical rept. no. 3)
(Contract Nonr-56232)
Unclassified report

DESCRIPTORS: *Metallic crystals, *Dipole moments, Metallurgy, Elasticity, Fatigue (Mechanics), Hardening, Fracture (Mechanics), Creep, Deformation.

As screw dislocations move through crystals they leave numerous edge dislocation dipoles in their wakes. This debris was observed in a broad variety of crystals including LiF; MgO; NaCl; Si; Fe; Zn; and Al. It plays an important role in strain-hardening; deformation band formation; steady-state creep; and probably in fatigue and other fracture processes. Here it will be argued that it also may account for the low-temperature internal friction peaks that appear following the plastic deformation of crystals. (Author)

AD-282 037 Div. 17
(TISTM/MS) OTS price $3.60

Bureau of Mines, Washington, D. C.
COMPOSITION AND MECHANICAL PROPERTIES OF SELECTED COLD-MOLD AND SKULL-CAST TITANIUM ALLOYS,
by E. D. Calvert, P. C. Magnusson and others.
1962, 26p. incl. illus. tables (Rept. of investigations no. 6014)
Unclassified report

DESCRIPTORS: *Titanium alloys, *Titanium castings, Metallurgy, Sheets, Molybdenum alloys, Aluminum alloys, Vanadium alloys, Manganese alloys, Forging, Melting, Casting, Physical properties, Mechanical properties.

Physical properties of 4 Ti-base alloys in ingot form and in sheet form were evaluated and correlated, where possible, with variations in the melting and casting procedure. Cold-mold ingots of Ti-8Mn and Ti-16V-2.8Al had cores of coarse dendritic-structured metal, and those of Ti-Mo-2Al had inclusions of undissolved alloying constituent. The skull-cast ingots of all compositions appeared sound. Mn content of the finished ingots was approximately the same in cold-mold and skull-cast ingots, but volatilization had removed about one quarter of the Mn which had been added. Al and Mo contents were appreciably lower in skull-cast than in cold-mold ingots, and the same was true to a lesser degree with Va. Skull-cast ingots had higher carbon content than cold-mold ingots. Cold-mold ingots of Ti-6Mo-2Al were harder by the Brinell test than skull-cast ingots, but the reverse was true of Ti-16V-2.8Al. (Author)

AD-282 053 Div. 17
(TISTM/MS) OTS price $5.60

Rock Island Arsenal, Ill.
SANDWICH DESIGN AIDS,
by Catherine M. Fitzpatrick. July 62, 50p. incl. illus. table, 1 ref. (Rept. no. 62-2355)
(Proj. 517-01-002)
Unclassified report

DESCRIPTORS: *Sandwich panels, *Sandwich construction, Physical properties, Mechanical properties, Sheets, Aluminum, Data, Tables, Design, Missile launchers.

Design aids which will simplify the analysis work for the designer of sandwich panels are presented. Included are rapid design charts for calculating the weight per square foot of sandwich panels; the moment of inertia of spaced facings; and the maximum deflection of uniformly loaded, simply supported rectangular sandwich plates. (Author)

AD-282 054 Div. 17
(TISTM/GEC) OTS price $6.60

RIAS, Inc., Baltimore, Md.
THE EFFECT OF COLD-WORK ON THE X-RAY DIFFRACTION PATTERN COPPER-SILICON-MANGANESE ALLOY,
by David O. Welch and Henry N. Otte. June 62, 63p. incl. illus. tables, 56 refs. (Technical rept. no. 3)
(Contract Nonr-370600)
Unclassified report

To be published in Advances in X-Ray Analysis, 1963, Vol. 6 (Proceedings of 11th Annual Conference on Applications of X-Ray Analysis, Aug 8-10, 1962, Denver, Colorado.)

# Division 17 - METALLURGY

DESCRIPTORS: *Copper alloys, *Silicon alloys, *Manganese alloys, *X-ray diffraction analysis, Metallic crystals, Alloys, Lattices, Elasticity, Stresses, Drawing (Machine processing), Tensile properties, Mechanical properties, Microstructure, Diffusion, Deformation.

Plastic deformation of metals produces a state characterized by the presence of residual elastic strains, small domains which diffract x-rays coherently, and often stacking faults; these effects may be studied with x-ray diffraction techniques. Changes in the lattice parameter, shifts in the relative positions of diffraction lines, and the broadening of diffraction lines were used to study the state of cold-work resulting in Cu-6.6 at -% Si-1.2 at -% Mn after deformation by filing, wire drawing, and uniaxial tension at room temperature. Both filing and wire drawing produced large root-mean-square strains and stacking faults, whereas deformation by tension up to 22% extension failed to produce any clear evidence of faulting or root-mean-square strains. Tensile deformation caused fragmentation of coherent domains to an average dimension of 250 A after 22% extension, and results in a radial, tensile, residual macrostrain arising from a smaller rate of work hardening in the surface layers than in the interior. Wire drawing also resulted in a residual macrostrain system. (Author)

AD-282 059 Div. 17, 8
(TISTM/GEC) OTS price $1.00

Vitro Labs., West Orange, N. J.
TRIMETALLIC FILM PREPARATION BY ELECTROPHORETIC DEPOSITION.
Final technical rept., 30 Dec 60-31 Dec 61,
by Martin H. Ortner and Stanley J. Klach.
June 62, 31p. incl. illus. tables, 36 refs.
(Contract AF 33(616)7727, Proj. 7062)
(ASD TDR 62-306) Unclassified report

DESCRIPTORS: *Metal films, *Electrophoresis, *Ferromagnetic materials, Molybdenum alloys, Nickel alloys, Iron alloys, Quartz, Surface properties, Thickness, Thin films, Deposits, Magnetic alloys, Switching circuits, Electronic switches.

The feasibility was demonstrated of preparing thin (6000 - 10000A), low coercive force, 4-79 Mo permalloy films on Mo on-quartz substrates by electrophoretic deposition. The trimetallic films prepared were uniform in composition and thickness, and had low drive field requirements. However, they did not exhibit the square loop behavior required for use as switching devices. The lack of uniaxial anisotropy may be due to surface imperfections, impurities, localized stress, or improper magnetic alloying and annealing. (Author)

AD-282 120 Div. 17
(TISTM/ODN) OTS price $1.60

Armour Research Foundation, Chicago, Ill.
ZONE REFINING OF CEMENTED TUNGSTEN-BASE ALLOYS.
Quarterly rept. no. 2, 1 Oct-31 Dec 61 on Development and Application of a Theory for Plastic Deformation of Cemented Alloys,
by N. M. Parikh. 29 Jan 62, 12p. incl. illus. table.
(Contract DA 11-022-505-ORD-3092, Proj. 5B4-002)
(WAL TR 272/32-3-T1) Unclassified report

DESCRIPTORS: *Tungsten alloys, *Zone melting, *Sintered alloys, Alloys, Nickel alloys, Iron alloys, Sheets, Production, Electron beams, Powder alloys, Metal forming presses, Tungsten, Iron, Nickel, Purification, Microstructure, Powder metallurgy, Chemical analysis, Tensile properties, Plasticity, Plastic flow, Deformation, Mechanical properties.

A series of experiments was made to scale-up efforts to produce large tungsten sheets. A 600-lb block of W-Ni-Fe powder was prepared by hydrostatic pressing. Twelve-inch square slabs (one inch thick) were cut from this block and sintered. Some were warm rolled and subjected to zone refining treatment by electron beam heating. The details of the experimental results are discussed. (Author)

AD-282 139 Div. 17
(TISTM/MS) OTS price $5.60

General Dynamics/Fort Worth, Tex.
MATERIAL - ALUMINUM HONEYCOMB CORE - EVALUATION TESTS (3003 AND 5052 ALLOYS),
by J. E. Thomas. 21 June 62, 59p. incl. illus. tables (Rept. no. FGT-2498)
(Contracts AF 33(600)36200 and AF 33(657)7248)
Unclassified report

DESCRIPTORS: *Aluminum alloys, *Honeycomb cores, Shear stresses, Stresses, Failure (Mechanics), Density, Tests, Mechanical properties.

This report includes:
North American Aviation Inc., Downey, Calif.
QUALIFICATION TEST - ALUMINUM HONEYCOMB CORE MATERIALS, by D. Drysol, J. C. Newland, and T. Price. 13 Aug 59. (Rept. no. MDL-203E)

All types of 3003 and 5052 alloy aluminum honeycomb core that were tested were found to conform to FMS-0027A and Amendment 2 of FMS-0027A except Types IID and IIIB (3003). Type IID failed in density and flatwise compression and was not tested further while Type IIIB failed only the density requirement. (Author)

AD-282 176 Div. 17
(TISTM/AW) OTS price $3.60

Hammond Metallurgical Lab., Yale U., New Haven, Conn.
MARTENSITIC TRANSFORMATION AND PLASTIC DEFORMATION IN IRON ALLOY SINGLE CRYSTALS.
Doctoral thesis,
by J. F. Breedis and W. D. Robertson. July 62, 17p. incl. illus. 19 refs. (Technical rept. no. 6)
(Contract Nonr-60928)
Unclassified report

DESCRIPTORS: *Iron alloys, Transformations, Martensite, Deformation, Single crystals, Austenite, Tensile properties, Shear stresses, Temperature, Stainless steel.

The characteristics of the deformation of austenite, and the influence on the martensitic transformation of elastic tensile stress and prior plastic deformation were studied in single crystals of Fe-16Cr-25Ni, Fe-16Cr-12Ni, and Fe-30Ni alloys. The influence of existing transformation products on the plastic deformation of the remaining austenite was observed. In general, small amounts of martensitic structures are formed under elastic stress at temperatures as high as 200 C above the spontaneous transformation temperature to strengthen crystals against subsequent deformation by slip. Large quantities of randomly dispersed martensite also decrease the extent of easy glide. Prior deformation on a single slip system suppresses the subsequent athermal transformation in both Fe-16Cr-12Ni and Fe-30Ni single crystals. From the drastically different behavior under stress observed at temperatures slightly above the spontaneous transformation temperature in Fe-16Cr-12Ni and Fe-

30Ni, it is evident that different transformation mechanisms are operative in these alloys. Several possible transformation mechanisms are proposed for the Fe-16Cr-12Ni composition. A mechanism involving an intermediate h.c.p. structure is best suggested by the observations. (Author)

AD-282 211 Div. 17, 14
(TISTM/MS) OTS price $7.60

Defense Metals Information Center, Columbus, Ohio.
DEFENSE METALS INFORMATION CENTER SELECTED ACCESSIONS,
comp. by Karen Barnes. June 62, 56p.
(Contract AF 33(616)7747, Proj. 2(8-8975))
Unclassified report

DESCRIPTORS: *Metals, *Alloys, *Bibliography, *Indexes, *Scientific reports, *Heat resistant alloys, *Refractory materials, *Composite materials, *Steel, *Stainless steel, Liquid rocket propellants, Rocket cases, Manufacturing methods.

Contents:
High-strength alloys
Cobalt base
Nickel base
Engineering steels
Stainless steels
Iron base
Light metals
Titanium
Magnesium
Nonmetallics
Carbon, graphite
Special refractories
Ceramic oxide
Refractory metals
Columbium
Chromium
Molybdenum
Rhenium
Tantalum
Tungsten
Miscellaneous
Coatings
Applications
Composites

AD-282 233 Div. 17
(TISTM/AW) OTS price $1.60

Watertown Arsenal Labs., Mass.
ASSESSMENT OF 9310 STEEL FOR CARBURIZED COMPONENTS IN M14 RIFLES.
Technical rept. on M14 Rifle,
by Paul V. Riffin and Joseph L. Sliney. July 62, 12p. incl. illus. tables, 1 ref. (Rept. no. WAL TR 739.1/4)
Unclassified report

DESCRIPTORS: *Small arms, *Steel, Materials, Carbon, Carbon alloys, Hardenability, Microstructure, Impact shock, Chemical analysis, Heat treatment, Tests, Military requirements.

The hardenability, microstructure and V-notch Charpy impact properties of SAE 9310 steel were evaluated. The results were compared with those of 8620 steel, and recommendations are made regarding the use of the 9310 steel for carburized components for critical service applications. (Author)

AD-282 312 Div. 17
(TISTM/ODN) OTS price $5.60

Massachusetts Inst. of Tech., Cambridge.
STRENGTHENING AND ANNEALING OF AUSTENITE FORMED BY THE REVERSE MARTENSITIC TRANSFORMATION.
Doctoral thesis,
by George Krauss, Jr. and Morris Cohen.
1 Dec 61, 52p. incl. illus. tables, 29 refs.
(Technical rept. no. 5)
(Contract Nonr-184135, Proj. 7618)
Unclassified report

DESCRIPTORS: *Austenite, *Martensite, *Transformation, *Alloys, Nickel alloys, Iron alloys, Carbon, Grains (Metallurgy), Microstructure, Heat treatment, Ferrites, Crystallization, Hardness, Mechanical properties, Deformation, Tensile properties.

The reverse martensitic transformation (i.e., the conversion of martensite to austenite on heating) was investigated in Fe-Ni alloys containing 30.5 - 33.5 w/o Ni. The reversed austenite was found to be sufficiently distorted to exhibit marked differences in mechanical properties and to undergo recovery and recrystallization on further heating. In particular, the yield strength of the reversed austenite was as much as 2.5 times higher than that of the virgin austenite; with five cycles of the direct and reverse martensitic transformation, the yield strength was 2.8 times higher. There was an accompanying decrease in strain-hardening capacity and in stable ductility or uniform elongation. The recrystallization was observed to follow sigmoidal kinetics, but was characterized by an abnormally large temperature dependence which was evidently due to carbon segregation at the migrating grain boundaries. Upon recrystallization, the strength properties reverted to those of the virgin austenite, but the ductility did not fully recover until the annealing temperature was raised. Transformation of reversed austenite to produce second-generation martensite resulted in an imperfect structure, leading to additional strengthening. (Author)

AD-282 331 Div. 17, 25
(TISTM/GEC) OTS price $1.10

Polytechnic Inst. of Brooklyn, N. Y.
A CREEP LAW TO ACCOUNT FOR MATERIAL COMPRESSIBILITY,
by F. A. Cozzarelli, B. Venkatraman, and Sharad A. Patel. July 62, 6p. 2 refs. (PIBAL rept. no. 656)
(Grant no. AF-AFOSR 62-200)
(AFOSR-3005) Unclassified report

DESCRIPTORS: *Creep, Deformation, Elasticity, Stresses, Metal plates, Sheets, Mathematical analysis, Theory.

Based on the linear stress-strain relations of classical elasticity and the analogy between creep and nonlinear elasticity, a creep law governing the behavior of compressible materials is formulated. The strain and complementary energy functions associated with the analogous elastic law are developed. Finally the nonlinear elastic law is used in deriving the moment-curvature relations governing the lateral bending of thin plates. (Author)

AD-282 352 Div. 17, 14
(TISTM/EJH) OTS price $6.60

Armour Research Foundation, Chicago, Ill.
HIGH-TEMPERATURE OXIDATION PROTECTIVE COATINGS FOR VANADIUM-BASE ALLOYS.
Final rept., 12 June 61-11 July 62,
by John J. Rusch and F. C. Holtz. 1 Aug 62, 62p. incl. illus. tables, 10 refs. (Rept. no. ARF 2227-6)
(Contract NOw 61-0806-c)
Unclassified report

DESCRIPTORS: *Vanadium alloys, *Niobium alloys, *Metal coatings, *Refractory coatings, Titanium alloys, Nickel plating, Silicides, Silicon coatings, Flame spraying, Oxidation inhibitors, Intermetallic compounds, Ceramic materials, Oxidation, High temperature research, Mechanical properties, Sheets.

More than 40 coating materials were investigated for the oxidation protection of V-Nb alloy sheet specimens at 2000 to 2400 F and above. The wide range of coatings included flame-sprayed ceramics, roll-bonded Fe-Cr-Al, slurry-coated or fused Zn, Al, Ni and other alloys, liquid-phase sintered Cr-noble metal alloys, sintered intermetallic compounds, and pack-cemented diffusion-type coatings. The most promising system studied was a diffusion-type silicide applied to V-1w/o Ti-60w/o Nb by a pack cementation process. This coating afforded excellent protection for at least 1000, 290, and 50 hours in static air at 2000, 2200, and 2500 F, respectively, and a remarkable capacity for tolerating defects was noted. Ni, flame-sprayed on V-1w/o Ti-60w/o Nb, could be exposed directly to elevated-temperature air, and the coating life was 150 and 50 hrs at 2000 and 2200 F, respectively. The alloy Fe-25w/o Cr-5w/o Al roll-bonded to V-5w/o-20w/o Nb was protective for about 80 hours at 2000 F; good bonds were not obtained on the higher-Nb alloy. In most cases, coatings survived much longer on V-1w/o Ti-60Nb than on the vanadium-rich alloy. (Author)

AD-282 362 Div. 17
(TISTM/GEC) OTS price $1.60

Keck, W. M., Lab. of Engineering Materials, Calif. Inst. of Tech., Pasadena.
RAPID QUENCHING OF LIQUID ALLOYS,
by Pol Duwez and R. H. Willens. July 62, 10p. incl. illus. 13 refs. (Technical rept. no. 7)
(Contract Nonr-22030)
Unclassified report

DESCRIPTORS: *Alloys, *Liquid metals, Melting, Cooling, Phase studies, Phase transitions, Pressure, Ejection, Shock tubes, Foils, Test equipment, Design, Crystal structure, Liquids.

A technique is described by which metastable alloy phases can be obtained by very rapid cooling from the liquid state. The results obtained so far have lead to extension of solubility limits beyond their equilibrium values, new phases not found under equilibrium conditions, and amorphous alloys. (Author)

AD-282 373 Div. 17
(TISTM/GEC) OTS price $3.60

Michigan U. Coll. of Engineering, Ann Arbor.
KINETICS OF SINTERING OF RUTILE SINGLE CRYSTAL SPHERES,
by H. M. O'Bryan, Jr. and G. Parravano. July 62, 32p. incl. illus. tables, 11 refs. (Rept. no. 02832-15-T)
(Contract AF 49(638)493, Proj. 9762)
(AFOSR-2763) Unclassified report

DESCRIPTORS: *Titanium compounds, Heat treatment, Sintering, Single crystals, Controlled atmospheres, Air, Reduction, Surface properties, Temperature, Kinetic theory, Dioxides.

The sintering of single crystal rutile has been studied in air and in reducing atmosphere in the temperature range 900 to 1350 C using a sphere-to-sphere model. Rate data show that there are two sintering periods: a slow initial growth characterized by a rate exponent n = 7 and a more rapid subsequent period n = 2. The development of flat surfaces or facets on the particles is used to explain the two periods. A scaling exponent of 3 and an activation energy of 70 kcal/mole indicate that volume diffusion is the sintering mechanism. The initial rate exponent cannot be explained. Increase sinterability of reduced rutile is explained by the defect structure. Facet formation on rutile spheres is discussed. (Author)

AD-282 379 Div. 17, 26, 27
(TISTM/EJH) OTS price $9.10

Pratt and Whitney Aircraft, East Hartford, Conn.
RESEARCH AND DEVELOPMENT OF TITANIUM ROCKET MOTOR CASE.
Quarterly interim technical rept. no. 7, 1 Jan-31 Mar 62,
by H. A. Hauser and W. E. Helfrich. 30 Apr 62, 105p. incl. illus. tables.
(Contract DA 19-020-ORD-5230, Proj. TB 4-004)
(WAL TR 766.2/1-6) Unclassified report

DESCRIPTORS: *Rocket cases, *Titanium alloys, Vanadium alloys, Chromium alloys, Aluminum alloys, Manufacturing methods, Welding, Forging, Heat treatment, Mechanical properties, Tensile properties, Electron beams, Microstructure.

Oxygen contents in the 0.10-0.20 per cent range do not seriously impair the smooth and notched (K sub t = 8) tensile ductility at -40F of press-forged material aged to the 180,000-190,000 psi room temperature yield strength level. Single-pass TIG welds made with parent metal hydrogen contents in excess of 300 ppm display a high incidence of weld porosity and premature failures under cyclic sustained tensile loads. Excellent fracture toughness can be achieved in single-pass TIG welds by cold rolling (50% reduction) and subsequent annealing at 1450F. A reduction in forging temperature (final operation) from 1850F to 1800F significantly improves the tensile ductility of a full scale 40-inch diameter rear dome press-forged in closed dies (three steps) by the dogbone technique. Press forging of full scale 40-inch diameter rear domes in closed dies (three steps) by the dogbone method at 1800-1850F produces anisotropy in tensile properties after aging to the 180,000 psi minimum yield strength level. Higher strength and lower elongations are observed in the tangential as compared to radial direction. (Author)

AD-282 400 Div. 17
(TISTM/ODN) OTS price $1.60

British Non-Ferrous Metals Research Association.
THE PROPERTIES OF GRAIN BOUNDARIES.
Annual technical rept. no. 1 for period ending 30 Apr 62.
May 62, 15p. illus. 8 refs.
(Contract DA 91-591-EUC-1755, Proj. 01-7590-61)
Unclassified report

DESCRIPTORS: *Stresses, *Crystals, *Copper, Alloys, Aluminum alloys, Aluminum, Copper alloys, Nickel alloys, Shear stresses, Microphotography, Tests, Carbon, Oxides, Films, Hydrogen, Creep, Argon, Grains (Metallurgy), Mechanical properties.

An investigation was carried out on the effect of alloying, temperature, stress and testing environment on the time-dependent sliding of two grains at a common plane grain boundary in bicrystal specimens of Cu. An investigation of the influence of testing environment, transverse stress and solid solution alloying on grain boundary sliding is reported. The boundary sliding tests were carried out by applying a compressive force at 45 degrees to the grain boundary plane and measuring the sliding by observing the relative movement of fiducial scratches

transverse to the boundary using a hot stage microscope; the tests were carried out at 742 C with a resolved shear stress on the boundary plane of 35 g/sq. mm. Tests have been carried out in various atmospheres and it was found that the rate of sliding was much faster in a H2 atmosphere than in a partial vacuum of 50 microns ($H_2$) pressure of Ar. A somewhat smaller increase in the rate of sliding was also obtained on crystals tested in CO. (Author)

AD-282 475 Div. 17, 25
(TISTM/GEC) OTS price $5.60

Illinois Inst. of Tech., Chicago.
ELECTRONIC ENTROPY IN LIQUID METAL SOLUTIONS.
Master's thesis,
by Lurance Marcine Webber. Jan 62, 54p. incl. illus. tables, 22 refs.
(Contract AF 49(638)346)
(AFOSR-1353) Unclassified report

DESCRIPTORS: *Liquid metals, Entropy, Electrons, Statistical distributions, Thermodynamics, Thermoelectricity, Tin alloys, Zinc alloys, Cadmium alloys, Palladium alloys, Silver alloys, Gold alloys, Electric potential, Tests, Test methods, Mathematical analysis, Theses, Specific heat.

The entropy of mixing of binary metallic solutions was studied. The contribution to the entropy of mixing arising from the change in the statistical distribution of electrons was the primary interest when two metallic components were mixed. The general nature of the deviations of the measured entropy of the mixing from the ideal behavior is recognizable from the nature of the assumptions involved in reducing the complete statistical formulation to the simple form of equation, which is based on the assumption of a completely random distribution of the two components of the solution. For metals, theoretical treatments indicate that the electronic heat capacity is linearly dependent on the absolute temperature. Consequently, integration to the temperature of measurement of the thermodynamic entropy is possible and can lead to the contribution of the electrons to the entropy of mixing. (Author)

AD-282 479 Div. 17
(TISTM/GEC) OTS price $1.60

Naval Research Lab., Washington, D. C.
LOW TEMPERATURE FATIGUE CRACKS AS DELIBERATE FRACTURE ORIGINS.
Interim rept.,
by J. E. Srawley and T. C. Lupton. 26 July 62, 8p. incl. illus. tables, 3 refs. (NRL rept. no. 5818)
Unclassified report

DESCRIPTORS: *Steel, *Fracture (Mechanics), Sheets, Tensile properties, Stresses, Tool steel, Heat treatment, Metallurgy, Fatigue (Mechanics), Low temperature research.

Specimens of 1/16 in. thick sheet of a high strength steel were provided with small surface cracks by fatigue stressing either at room temperature or at -22 F. The specimens were then tested in tension to evaluate the effectiveness of the fatigue cracks by measurements of apparent K sub Ic plane strain crack toughness values. The cracks formed at -200 F gave rather less consistent results and somewhat higher average apparent K sub Ic values at room temperature and at -100 F than did those formed at room temperature. It was also observed that the progress of fatigue cracking was more erratic at the lower temperature. (Author)

AD-282 509 Div. 17
(TISTM/GEC) OTS price $3.60

Rensselaer Polytechnic Inst., Troy, N. Y.
FRACTURE BEHAVIOR OF A DISPERSION-STRENGTHENED SAP-TYPE ALLOY,
by G. S. Ansell and H. S. Kim. 20 July 62, 24p. illus. 12 refs. (Technical rept. no. 1)
(Contract Nonr-59115, Proj. NR 031-689)
Unclassified report

DESCRIPTORS: *Aluminum alloys, Powder metallurgy, Dispersion hardening, Aluminum compounds, Oxides, Fracture (Mechanics), Sintered alloys, Grains (Metallurgy), Impact shock, Tests, Electron microscopy, Deformation, Temperature, Microstructure, Low temperature research, Powder alloys.

The fracture surfaces of Al-Al2O3, SAP-type dispersion-strengthened alloy specimens, broken in impact over the temperature range 20 C to -170 C, were examined visually and by means of electron microscopy. Test temperature, dispersed particle morphology, grain size and the method of alloy fabrication all affected the mode of fracture. Conventional fabrication of Al SAP-type alloys produced grain boundary porosity associated with reduced ductility. Specimens fabricated using a vacuum annealing treatment before final consolidation have more ductility than specimens of commercial purity Al. The presence of the grain boundary porosity coupled with the fine Al2O3 dispersion can produce independently nucleated microcleavage facets in the Al matrix. The appearance of this type of fracture is very similar to that observed for dispersion-strengthened non-metallic crystalline materials. (Author)

AD-282 515 Div. 17, 4
(TISTM/MS) OTS price $1.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
FORMATION AND DEPOSITION OF FERRITE FILMS,
by William L. Wade, Thomas Collins, and Walter W. Malinofsky. Feb 62, 15p. incl. illus. tables.
(Technical rept. no. 2249)
Unclassified report

DESCRIPTORS: *Ferrites, *Metal films, Nickel compounds, Magnesium compounds, Manganese compounds, Electrochemistry, Microwaves, Measurement, Crystals, X-ray diffraction analysis, Crystal structure, Physical properties, Processing.

Three aspects of a ferrite film study are described. The first phase covers chemical deposition techniques, including preparation of the basic chemical solutions and the process details of forming films of nickel ferrite, magnesium ferrite, and manganese ferrite. The second portion is devoted to an evaluation of the microwave properties of these ferrite films. Finally, the results of a crystallographic study of the films by X-ray diffraction methods are reported. (Author)

AD-282 516 Div. 17, 26
(TISTM/GEC) OTS price $1.60

Armour Research Foundation, Chicago, Ill.
PILOT EVALUATION OF VANADIUM ALLOYS.
Bimonthly rept. no. 5, 18 May-17 July 62,
by B. R. Rajala and F. C. Holtz. 14 Aug 62, 13p. incl. table (Rept. no. ARF 2231-5)
(Contract NOw 62-0101-c)
Unclassified report

DESCRIPTORS: *Vanadium alloys, *Manufacturing methods, Niobium alloys, Tensile properties, Heat treatment, Mechanical properties, Processing, Carbon, Oxygen, Nitrogen, High temperature research, Tests, Zirconium alloys, Carbon alloys, Tantalum alloys, Tungsten alloys, Titanium alloys, Molybdenum alloys, Ruthenium, Melting, Extrusion.

Experimental 200-g V-Nb alloys were fabricated by hot, warm, and cold working techniques. At 2400 F, V-5 wt-% Ti-20 wt-% Nb base compositions complexed with C, O, and/or N had ultimate tensile strengths in the range of 7,900 to 9,500 psi. When 1 or 2 wt-% Zr in combination with C was added to the V-20 wt-% Nb base, 2400 F strengths increased to about 12,500 psi. The addition of 10 wt-% Ta or W to the V-20 wt-% Nb base produced ultimate tensile strength values of 15,500 psi at 2400 F. At the 60 wt-% Nb level, the composition V-1 wt-% Ti-60 wt-% Nb-2.5 wt-% Mo-0.5 wt-% Ru had a 2400 F strength of 21,300 psi. A 100-lb V-1 wt-% Ti-60 wt-% Nb ingot weighed 65 lbs. after scalping. Subsequent extrusion at a 4 to 1 ratio yielded a 39-lb sheet bar; major losses were due to a pipe in the ingot and to surface checking during extrusion. (Author)

AD-282 638 Div. 17
(TISTM/GEC) OTS price $1.60

Colorado School of Mines, Golden.
IMPROVED OXIDATION RESISTANCE OF MOLYBDENUM BY ALLOYING WITH RARE EARTH AND OTHER SELECTED METALS.
Interim rept. no. 4, 1 May-30 June 62.
27 July 62, 8p. incl. table, 2 refs.
(Contract NOw 62-0305-d)
Unclassified report

DESCRIPTORS: *Molybdenum alloys, *Oxidation, *Rare earth elements, Oxidation inhibitors, Additives, Yttrium, Hafnium alloys, Oxides, Coatings, Controlled atmospheres, Hydrogen, Oxygen, Helium, Heat resistant alloys, Metals, Alloys, Chemical properties.

A new method of forming a protective oxide scale on Mo-Hf and Mo-Yt alloys has been introduced by using a combination of selective oxidation and sacrificial oxidation. Oxidation experiments were carried out at 725 C on binary Mo alloys containing 2.6 At-% Yt and 5.6 At-% Hf in which the Yt and the Hf had been selectively oxidized by a process of internal oxidation. These experiments were successful in producing a continuous internal scale from which the outer layer of Mo was then removed by volatilization as $MoO_3$. Although a continuous scale was produced in this manner with the 5.6 At-% Hf alloy it was not completely adherent. It peeled in some places and was quite adherent in others. With 2.6 At-% Yt the specimen became coated with a liquid oxide mixture at 725 C, indicating the formation of a low melting point eutectic. A technique for selective oxidation of Mo-Hf alloys in a He atmosphere was developed. The introduction of O from the furnace refractories and other similar sources was eliminated. (Author)

AD-282 720 Div. 17, 26
(TISTM/EJH) OTS price $1.00

Brush Beryllium Co., Cleveland, Ohio.
DEVELOPMENT OF FINE DIAMETER HIGH-PURITY WIRE FROM ZONE-REFINED BERYLLIUM.
Progress rept. no. 1, 1 Apr-31 May 62,
by A. G. Gross, Jr. and R. G. O'Rourke.
31 May 62, 30p. incl. illus. table, 9 refs.
(Technical rept. no. 263-236)
(Contract NOw 62-0067-c)
Unclassified report

DESCRIPTORS: *Beryllium, *Wire, Single crystals, Crystals, Deformation, Heat treatment, Drawing (Machine processing), Zone melting, Microstructure, Mechanical properties, Tensile properties.

Single crystals of zone-refined Be were jacketed in mild steel tubing and were swaged at 450 C. Various intermediate anneals were employed. When the Be had been reduced to the desired diameter, swaging was stopped and the jacket was removed. The high-purity Be wire was then deformed by standard Be wire-drawing techniques. Extensive longitudinal rupturing occurred during this operation and very poor yields were experienced. Even so, a fair amount of fabrication experience was gained and some important metallurgical information was generated. (Author)

AD-282 732 Div. 17, 26
(TISTM/EJH) OTS price $4.60

Alloyd Corp., Cambridge, Mass.
RESEARCH ON THE PRODUCTION OF ULTRA-PURE MOLYBDENUM.
Final rept.,
by Noel W. Kirshenbaum, Robert Bakish and Mario Badiali. 15 Jan 62, 38p. incl. illus. tables.
(Contract NOw 61-0242-c)
Unclassified report

DESCRIPTORS: *Molybdenum, Chlorides, Purification, Sublimation, Fractionation, Zone melting, Reduction, Melting, Electron beams, Laboratory equipment, Production.

The objective was to design and construct an apparatus capable of producing extremely pure Mo in limited quantities and to produce one pound of such metal. A single, carefully-controlled sublimation of $MoCl_5$ yielded a highly purified product without prior purification or recourse to repeated sublimation. Hydrogen reduction of $MoCl_5$ to metal was attempted at atmospheric pressure; to obtain substantial yields it was necessary to operate reductions at reduced pressure. Tubular deposits of metal were consolidated into bulk form by electron beam melting under high vacuum yielding a very low impurity level of gases. Problems involved in monitoring the purity of these materials and the analytical results are also presented. (Author)

AD-282 736 Div. 17
(TISTM/MS) OTS price $1.60

Armour Research Foundation, Chicago, Ill.
DEVELOPMENT AND APPLICATION OF A THEORY FOR PLASTIC DEFORMATION OF CEMENTED ALLOYS. TASK 3. COPPER-COOLED TUNGSTEN FIBER ROCKET NOZZLE MATERIALS.
Quarterly rept. no. 1, 1 July-30 Sep 61,
by T. J. Koppenaal. 27 Oct 61, 15p. incl. illus.
(Contract DA 11-022-505-ORD-3092, Proj. TB4-002)
(WAL TR 372/32-1-T3)
Unclassified report

DESCRIPTORS: *Rocket motor nozzles, *Alloys, *Powder alloys, Nickel alloys, Copper alloys, Tungsten alloys, Reinforcing materials, Refractory materials, Tungsten wire, Heat resistant materials, Insulating materials, Deformation, Theory, Fibers, Bonding, Density, Sintering, Manufacturing methods, Metallic textiles, Microstructure, Tensile properties, Design, Mechanical properties, Physical properties.

Copper and copper-nickel alloys were used as matrix material for the purpose of tungsten-tungsten bonding of fibers in tungsten felts. Initial experiments with different diameter tung-

sten fibers indicate that a certain nickel-to-copper ratio is optimum for maximum strength of the composite. (Author)

AD-282 738 Div. 17
(TISTM/MS) OTS price $1.60

Armour Research Foundation, Chicago, Ill.
DEVELOPMENT AND APPLICATION OF A THEORY FOR PLASTIC DEFORMATION OF CEMENTED ALLOYS. TASK 1. ZONE REFINING OF CEMENTED TUNGSTEN-BASE ALLOYS.
Quarterly rept. no. 1, 1 July-30 Sep 61,
by N. M. Parikh. 27 Oct 61, 15p. incl. illus. tables.
(Contract DA 11-022-505-ORD-3092, Proj. TB4-002)
(WAL TR 372/32-1-T1) Unclassified report

DESCRIPTORS: *Tungsten, *Tungsten alloys, Nickel alloys, Iron alloys, Powder metallurgy, Sintering, Purification, Zone melting, Microstructure, Tensile properties, Mechanical properties, Crystallization, Grains (Metallurgy), Sheets, High temperature research, Plasticity, Deformation, Manufacturing methods, Feasibility studies, Sintering, Processing.

This program concerns the development of a process for fabrication of tungsten sheet using tungsten-nickel-iron alloys as a starting material. Initial attempts in scaling up the process were successful. Sintering, warm rolling and zone refining tungsten-nickel alloys presented no difficulties. Eight inch wide hot rolled tungsten sheets were made by this process. (Author)

AD-282 808 Div. 17, 25
(TISTM/EJH) OTS price $8.60

High Velocity Lab., U. of Utah, Salt Lake City.
HYPER-ELASTIC IMPACTS,
by Neil P. Bailey, C. Eugene McDermott and others. 1 May 62, 80p. incl. illus. tables, refs. (Technical rept. no. UU-8)
(Contract AF 04(647)942)
(BSD TDR 62-146) Unclassified report

DESCRIPTORS: *Elasticity, *Aluminum alloys, *Copper, *Steel, *Metals, *Wave transmission, Deformation, Impact shock, Rods, Strain gages.

A study was made of one-dimensional wave propagation in and above the elastic range in rods of 24T4 aluminum, 1018 steel, and copper. Theory was developed describing the waves as consisting of a front of decreasing steepness followed by a zone of inelastic slip. Strain gage measurements were used to verify the theory.

AD-282 866 Div. 17
(TISTM/EJH) OTS price $.50

Naval Research Lab., Washington, D. C.
STANDARD METHOD FOR NRL DROP-WEIGHT TEST.
Final phase rept.,
by P. P. Puzak and W. S. Pellini. 21 Aug 62, 19p. incl. illus. (NRL rept. no. 5831)
Unclassified report

DESCRIPTORS: *Steel, Tests, Standardization, Mechanical properties, Fracture (Mechanics), Test equipment, Test methods.

The NRL drop-weight test was developed in 1952 and has been used extensively to investigate the factors which determine the conditions required for the initiation of brittle fractures in structural steels. Drop-weight test facilities have now been established at several Navy activities and numerous research institutions and industrial organizations in this country and abroad. In addition, the test method is used for specification purposes by some industrial organizations furnishing materials for critical naval applications. To insure that tests conducted at different (or new) locations will have a common meaning, it has become necessary to prepare a standard procedure. The details given herein are recommended for consideration by cognizant BuShips Codes for specification as a NavShips standard for drop-weight tests of ferritic steels. (Author)

AD-282 896 Div. 17, 26
(TISTM/EJH) OTS price $2.60

Astronuclear Lab., Westinghouse Electric Corp., Pittsburgh, Pa.
PILOT PRODUCTION AND EVALUATION OF TANTALUM ALLOY SHEET.
Quarterly progress rept. no. 1, 16 Apr-16 July 62,
by R. L. Ammon and R. T. Begley. 1 Aug 62, 25p. incl. illus. tables, 9 refs. (Rept. no. WANL-PR-M-001)
(Contract NOw 62-0656-d)
Unclassified report

DESCRIPTORS: *Tantalum alloys, *Heat resistant alloys, Sheets, Tungsten alloys, Hafnium alloys, High temperature research, Low temperature research, Mechanical properties, Tensile properties, Processing, Extrusion, Melting, Production.

The primary purpose of this program is to conduct detailed studies of the properties and processing of Ta rich alloys in the Ta-W-Hf system. An initial portion of the program will consist of establishing base line properties on the Ta-8W-2Hf alloy. Physical and mechanical properties will be evaluated on the basis of: (1) Tensile properties (-452 to 3500F); (2) Stress rupture properties (1 to 10 hrs at 2400 and 3000F); (3) Recrystallization; (4) Thermal expansion; (5) Hot hardness; (6) Weldability. Melting and processing of 3-inch diameter alloy ingots to sheet is described in detail. Preliminary elevated and low temperature mechanical properties are given.

AD-282 927 Div. 17, 26
(TISTM/EJH) OTS price $2.00

Crucible Steel Co. of America, Pittsburgh, Pa.
DEVELOPMENT OF NEW AND USEFUL ELEVATED-TEMPERATURE STEELS FOR AIRCRAFT APPLICATIONS.
Rept. for June 60-July 61 on Materials Application,
by A. Kasak, V. K. Chandhok, and E. J. Dulis. June 62, 72p. incl. illus. tables.
(Contract AF 33(616)7376, Proj. 7381)
(ASD TR 61-386) Unclassified report

DESCRIPTORS: *Heat resistant alloys, *Stainless steel, *Steel, *Corrosion resistant alloys, Martensite, Molybdenum alloys, Chromium alloys, Vanadium alloys, Cobalt alloys, Carbon alloys, High temperature research, Heat treatment, Tensile properties, Corrosion, Oxidation, Welding, Processing, Hardness, Mechanical properties.

Of the large number of experimental compositions investigated, the 0.15 C - 14.5 Cr - Mo - V - Co type steels indicated the best combination of desired characteristics and properties. A nominally 0.15 C - 14.5 Cr - 5 Mo - 0.5 V - 13.5 Co steel, Steel AFC 77, was selected for scaling-up for production on mill facilities. Steel AFC 77 has very high strength (290,000 psi tensile strength) at the ambient temperature and retains its strength remarkably well up to about 1200 F (120,000 psi tensile strength at 1200 F). In fact, Steel AFC 77 has appreciably higher strength, particularly in prolonged exposures,

than any stainless steel known. The excellent strength properties over a wide temperature range are accompanied by good ductility; indications of good formability and weldability were also obtained. In addition to its superior mechanical properties, Steel AFC 77 is resistant to atmospheric corrosion and oxidation. (Author)

AD-282 955 Div. 17
(TISTW/RD) OTS price $1.10

Oregon Metallurgical Corp., Albany.
EVALUATION OF MOLYBDENUM METAL PRODUCED BY THE TIN REDUCTION OF MOLYBDENUM DISULPHIDE PROCESS.
Quarterly progress rept. no. 1, 13 Apr-13 July 62,
by Charles Krey, Allen D. Abraham, and Stephen M. Shelton. 13 July 62, 6p.
(Contract NOw-62-0754-c; Continuation of Contract NOrd-18124)
Unclassified report

DESCRIPTORS: *Molybdenum, *Powder metallurgy, Reduction, Sulfides, Tin, Powder metals, Chemical properties, Physical properties, Production.

Research is presented which deals with producing 200-300 lb of Mo metal powder by the Nachtmann-Poole process, conversion of the powder to arc-cast ingots, and testing physical and chemical properties of the metal produced. A comparison is made between the properties of Nachtmann-Poole molybdenum and commercial Mo metal. (Author)

AD-282 996 Div. 17, 26
(TISTM/GEC) OTS price $1.10

Aerospace Information Div., Washington, D. C.
SECTIONAL FORGINGS OF AIRCRAFT PANELS.
9 Aug 62, 3p. incl. illus. (AID rept. no. 62-111; Trans. of Manufacture of Panels by the Method of Sectional Forging, Kuznechno-shtampovochnoye Proizvodstvo, no. 6, pp. 4-8, June 62)
Unclassified report

DESCRIPTORS: *Metal plates, *Airframes, Sheets, Forge presses, Dies, Deformation, Manufacturing methods, Processing, USSR, Forging.

To overcome the need for heavy presses with capacities of 30,000 to 70,000 tons for the die forging of panels and to correct elastic deformation of the press ram, table, and die, which causes dimensional and shape deviations, a forging technology was developed in which the panel is forged in sections. An experimental panel was forged from 7075 aluminum-alloy plate 600 x 510 x 25 mm. Visual and dimensional inspection showed that the finished panel had a satisfactory surface quality and ±0.2 to ±0.3 mm variations in distances of 190 and 180 mm between the transverse ribs and the longitudinal ribs, respectively. (Author)

AD-283 027 Div. 17
(TISTM/GEC) OTS price $1.10

General Dynamics/Fort Worth, Tex.
MATERIAL - ALCLAD X2219-T6 ALUMINUM ALLOY EFFECT OF AGING CYCLE ON TENSILE PROPERTIES - DETERMINATION OF.
Test data memo.,
by P. F. Ghena. 19 July 62, 4p. incl. illus. table (Rept. no. FTDM-2284)
(Contract AF 33(657)7248)
Unclassified report

DESCRIPTORS: *Aluminum alloys, Heat treatment, Aging, Tests, Temperature, Mechanical properties, Test methods, Tensile properties.

Tests were conducted to determine what effect two aging cycles, 420 F for 16 hrs and 375 F for 18 hrs, had on the tensile properties of X2219-T6 at room and elevated temperatures. (Author)

AD-283 028 Div. 17
(TISTM/GEC) OTS price $2.60

General Dynamics/Fort Worth, Tex.
MATERIAL - BRAZED HONEYCOMB PANEL REPAIRS SONIC VIBRATION TEST.
Test data memo.,
by C. A. Eberhardt. 26 July 62, 25p. incl. illus. tables (Rept. no. FTDM-2500-24)
(Contract AF 33(657)7248)
Unclassified report

DESCRIPTORS: *Honeycomb cores, *Sandwich panels, Brazing, Fatigue (Mechanics), Acoustics, Vibration, Tests, Resonance, Stainless steel, Stresses, Failure (Mechanics).

Sonic vibration tests were made on brazed honeycomb core stainless steel panels with patch repairs to determine the sonic fatigue life. (Author)

AD-283 054 Div. 17
(TISTM/GEC) OTS price $1.60

General Dynamics/Fort Worth, Tex.
MATERIAL - ZINC-TREATED MAGNESIUM - METAL PLATING - PHYSICAL PROPERTIES - EVALUATION OF,
by W. L. Armstrong. 26 Mar 58, 12p. incl. tables (Rept. no. FTDM-1886)
(Contract AF 33(657)7248)
Unclassified report

DESCRIPTORS: *Magnesium alloys, Physical properties, Electroplating, Tin coating, Zinc plating, Adhesion, Temperature, Thermal stresses, Corrosion inhibition, Tin alloys, Zinc alloys, Processing.

An investigation was made of the physical properties of Sn and Sn-Zn alloy electroplates, Zn-treated HK-31 and AZ-31 Mg alloys. The Mg specimens were Zn-treated prior to the application of platings. Specimens were cleaned and electroplated with 0.0005 in. of Sn or Sn-Zn alloy by various procedures. Specimens were then visually examined for defective platings. Specimens which exhibited no defects were given adhesion, heat cycling, and salt spray exposure tests. None of the procedures produced a successful electroplate on the AZ-31 alloy. Attractive platings were obtained on the HK-31 alloy and these platings exhibited excellent adhesion and thermal shock properties but poor salt spray resistance. (Author)

AD-283 058 Div. 17
(TISTM/GEC) OTS price $3.60

General Dynamics/Fort Worth, Tex.
CONTROL SURFACES - LOW TEMPERATURE BRAZE MATERIAL - EVALUATION OF,
by W. M. Pratt. 26 July 62, 36p. incl. illus. tables (Rept. no. FGT-2088)
(Contracts AF 33(600)36200 and AF 33(657)7248)
Unclassified report

DESCRIPTORS: *Stainless steel, Brazing, Sandwich panels, Silver solders, Lithium alloys, Silver alloys, Mechanical properties, Tensile properties, Elasticity, Heat treatment, Foils, Processing, Control surfaces, Maintenance, Honeycomb cores.

An investigation was made to select a brazing alloy for use in the repair brazing of 17-7 PH honeycomb sandwich panels and to determine the

extent of damage to the strength of the heat treated panels, caused by the localized repair brazing temperature. A brazing alloy consisting of 97% Ag and 3% Li, Ni plated, gave the most satisfactory brazed joints. The use of this brazing alloy, with the repair method developed, enabled reproducible repairs to be made on 17-7 PH honeycomb sandwich panels. The yield strength of heat treated 17-7 PH stainless steel in the area of the braze was reduced to approximately 40 to 45% of the original TH 1050 value, and the ultimate strength was reduced to 65 to 70%. The elongation was almost doubled. Preliminary tests indicate this strength loss may be partly offset by other factors and scheduled testing will determine the extent of damage to the repair area. (Author)

AD-283 065 Div. 17, 8
(TISTP/JW) OTS price $8.60

Pittsburgh U., Pa.
THEORETICAL PROBLEMS IN FERRO- AND ANTIFERROMAGNETISM.
Doctoral thesis,
by Rudolph John Joenk, Jr. 1962, 85p. incl. illus. tables, refs.
(Contract AF 49(638)323)
Unclassified report

DESCRIPTORS: *Ferromagnetism, *Magnetic properties, Magnetic fields, Wave analysis, Crystals, Spin, Resonance, Theses, Absorption.

AD-283 080 Div. 17, 26
(TISTW/DLW) OTS price $1.60

Brush Beryllium Co., Cleveland, Ohio.
DEVELOPMENT OF FINE DIAMETER HIGH-PURITY WIRE FROM ZONE-REFINED BERYLLIUM.
Progress rept. no. 2, 1 June-1 Aug 62,
by A. G. Gross, Jr. and R. G. O'Rourke.
1 Aug 62, 15p. incl. illus. tables (Technical rept. no. 276-236)
(Contract NOw 62-0067-c)
Unclassified report

DESCRIPTORS: *Beryllium, Single crystals, Processing, Fracture (Mechanics), Mechanical properties, Tensile properties, Wire.

Efforts continued on the fabrication of wire from single crystals of zone-refined Be. Swaging and wire-drawing results are presented. The primary cause of fracture during wire drawing is believed to be the stringers of nonmetallic inclusions which are consistently present in the zone-refined beryllium. The interpretation of the results of the tensile testing of A.11 at 0.027-in. diam was shown to be valid. It was shown that the swaging and wire-drawing operations do not contaminate chemically the zone-refined Be. (Author)

AD-283 093 Div. 17
(TISTM/JRG) OTS price $5.60

Illinois U., Urbana.
THE ANNEALING OF PURE GOLD QUENCHED FROM ABOVE 800 C,
by M. de Jong and J. S. Koehler. July 62, 55p. incl. illus. table, 15 refs. (Technical rept. no. 4)
(Contract Nonr-183426)
Unclassified report

DESCRIPTORS: *Gold, Wire, Resistance, Heat treatment.

The decrease in resistivity as a function of time of Au wires quenched from above 800 C and then annealed in the vicinity of room temperature is observed to be an S-shaped curve. (Author)

# 18. MILITARY SCIENCES AND OPERATIONS

AD-282 136 Div. 18
(TISTW/DLW) OTS price $4.60

Air Force Office of Scientific Research, Washington, D. C.
THE ATTACK AND DEFENSE OF TARGETS BY MISSILES,
by W. R. McEwen. July 62, 39p. incl. illus.
(Rept. no. AFOSR/DRA 62-9)
Unclassified report

DESCRIPTORS: *Games theory, *Antiaircraft defense systems, *Guided missiles (Surface to surface), Probability, Statistical analysis, Surface targets, Military operations, Interception probabilities.

Optimum methods are derived of attacking and defending targets with missiles under certain assumptions as to the number of missiles, antimissiles, and targets. Both probability and game theory are used in the derivations, and the results obtained by both methods are shown to be substantially the same. (Author)

AD-282 422 Div. 18, 1
(TISTA/GEC) OTS price $7.60

George Washington U., Washington, D. C.
A STUDY OF USAGE AND PROGRAM RELATIONSHIPS FOR AVIATION REPAIR PARTS,
by Marvin Denicoff and Sheldon Haber. 7 Aug 62, 78p. incl. tables (Serial no. T-140/62)
(Contract Nonr-76105, Proj. NR 047-001)
Unclassified report

DESCRIPTORS: *Jet fighters, *Naval supplies, Aircraft equipment, Probability, Statistical analysis, Effectiveness, Naval aircraft, Naval operations, Logistics.

The general characteristics of usage at base level of aviation repair parts and components is examined for the F4D-1. Also investigated is the relationship between usage and various program elements. In particular, little correlation is found between usage and flying hours. Because usage is generally low and sporadic, the assumption is tested that usage patterns are describable by probability distributions, namely, the Poisson and negative binomial distributions. (Author)

# 19. NAVIGATION

AD-281 855 Div. 19, 1, 30
(TISTA/VGW) OTS price $8.60

Bell Helicopter Corp., Fort Worth, Tex.
ARMY-NAVY INSTRUMENTATION PROGRAM. THE ROLE OF MOTION INFORMATION AND ITS CONTRIBUTION TO SIMULATION VALIDITY,
by W. E. Feddersen. Apr 62, 97p. incl. illus. 13 refs. (Rept. no. D228-429-001)
(Contract Nonr-167000)
Unclassified report

DESCRIPTORS: *Flight simulators, *Helicopters, Achievement tests, Flight testing, Control systems, Effectiveness, Statistical functions, Mathematical analysis, Motion, Flight simulators.

The use of a motion simulator in the evaluation and testing of display and instrumentation concepts which are central to the objectives of the

Army-Navy Instrumentation Program (ANIP) poses the same question, to what extent does the device allow a valid evaluation of the developments under consideration. The ultimate in validity would be achieved when operator behavior in the simulator corresponds precisely to control behavior in the system being simulated which, in this case, is a helicopter in all of its flight modes. Since it is unrealistic to expect exact behavior correspondence in the two situations the task is one of determining the extent or degree of approximation. This report summarizes the results of a series of three investigations, both simulator and flight test, designed to determine the relative proficiency allowed by motion information in the simulator in a hovering flight mode and, secondly, to determine with appropriate measures the degree to which control behavior in the helicopter is approximated by behavior in the simulator when the tasks are equivalent. The proficiency results are reported in terms of integrated absolute error scores about the various axes defining the hovering task, and the behavioral data, are presented in the form of auto-correlation functions. (Author)

AD-282 224 Div. 19
(TISTW/DLW) OTS price $6.60

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
EVALUATION OF THE AIR-TO-AIR TACAN RANGING SYSTEM FIELD MODIFICATION KITS.
Final rept.,
by Oscar Shames. 11 June 62, 55p. incl. illus. 17 refs. (Rept. no. NADC-EL-6223)
Unclassified report

DESCRIPTORS: *Radio navigation, *Range finding, *Radio beacons, Ultra high frequency, Airborne, Solid state physics, Modulators, Flight testing, Air to air.

Two methods of implementing air-to-air TACAN ranging via a field kit modification of radio set AN/ARN-21B were compared. One method followed closely the techniques previously employed by NAVAIRDEVCEN in the original air-to-air TACAN ranging conception. The other method utilized later state of the art techniques including a solid state modulator, to accomplish the same general results. The solid state approach was chosen as the preferred implementation, on the basis of laboratory and flight tests. A specification reflecting this approach was issued, and recommendations concerning fleet use were made. (Author)

AD-282 404 Div. 19, 2
(TISTP/GRW) OTS price $14.00

Boeing Co., Renton, Wash.
GREAT CIRCLE EQUIVALENT ROUTE WINDS FOR MILITARY APPLICATIONS AT HEIGHTS OF 20,000, 30,000, 40,000 AND 53,000 FEET,
by N. M. Barr, E. M. Hansen and others. July 62, 197p. (Reviews in Geophysics no. 5; Document no. D6-9175)
Unclassified report

DESCRIPTORS: *Wind, *Jet planes, *Flight paths, Tables, Statistical analysis, Northern Hemisphere, Periodic variations, Computers.

Equivalent headwinds or equivalent winds are computed using Sawyer's method for about 2000 routes over strategic air routes. The seasonal mean equivalent wind and its standard deviation and the annual 50-, 75- and 85-% reliability equivalent winds are tabulated. Route winds are computed for the 20,000-, 30,000-, 40,000- and 53,000-ft levels. An IBM 7090 program was used to compute the equivalent winds. Input data for the program consist, for each level, of a grid composed of the mean vector wind and the standard vector deviation at the intersection of each 5 deg of latitude with 10 deg of longitude between 60 S and 60 N and at the intersection of each 5 deg of latitude with each 20 deg of longitude south and north of 60 S and 60 N respectively. In addition to the equivalent winds, great circle distances are computed and tabulated for each route. (Author)

AD-282 662 Div. 19, 2
(TISTP/GRW) OTS price $16.00

Boeing Co., Renton, Wash.
EQUIVALENT WINDS FOR WORLD AIR ROUTES AT HEIGHTS OF 20,000, 30,000, 40,000 AND 53,000 FEET,
by N. M. Barr, E. M. Hanses and others. July 62, 246p. incl. illus. tables, 21 refs. (Reviews in Geophysics no. 4; Document no. D6-9177; Supersedes Document no. D6-5187)
Unclassified report

DESCRIPTORS: *Wind, *Jet planes, *Flight paths, Tables, Statistical analysis, Northern hemisphere, Southern hemisphere, Periodic variations, Computers.

Equivalent headwinds or equivalent winds are computed using Sawyer's method for about 2000 routes over strategic air routes. The seasonal mean equivalent wind and its standard deviation and the annual 50-, 75- and 85% reliability equivalent winds are tabulated. Route winds are computed for the 20,000-, 30,000-, 40,000- and 53,000-ft levels. An IBM 7090 program was used to compute the equivalent winds. Input data for the program consist, for each level, of a grid composed of the mean vector wind and the standard vector deviation at the intersection of each 5 deg of latitude with each 10 deg of longitude between 60 S and 60 N and at the intersection of each 5 deg of latitude with each 20 deg of longitude south and north of 60 S and 60 N respectively. In addition to the equivalent winds, great circle distances are computed and tabulated for each route. (Author)

AD-282 787 Div. 19
(TISTP/GRW) OTS price $3.60

Northrop Space Labs., Hawthorne, Calif.
LUNAR TRACKER MATHEMATICAL TECHNIQUES AND DIGITAL SIMULATION,
by G. J. Goodman, R. B. Freund and H. B. Kennedy. 1962, 1v. incl. illus. 1 ref.
(Contract AF 33(616)8242)
Unclassified report

DESCRIPTORS: *Lunar probes, *Celestial navigation, *Optical tracking, Simulation, Moon, Illumination, Digital computers, Geometry.

Optical techniques for lunar flight midcourse tracking of the center of the partially illuminated moon were studied and an experimental model of a complete tracking system based on one of the techniques was designed, fabricated and tested. Consideration is given to the mathematical techniques and the digital simulation of the experimental tracker whose axis is directed toward the center of the moon by means of three measurements of the distance from the axis to the image of the bright limb. The scanning system analytical model, control computer equations, closed-loop servo equations, random errors, and certain hardware nonlinearities included in

the simulation are discussed and simulation results are presented in graphical form. Also presented are two promising methods for extension of the mathematical techniques of the experimental model to close range planet tracking. (Author)

AD-282 867 Div. 19
(TISTW/DLW) OTS price $1.10

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
INCREASED OPERATIONAL CAPABILITY OF A LORAN-C RECEIVER (TECHNICAL NOTE),
by R. DeSipio. 21 Aug 62, 6p. 13 refs.
(Rept. no. NADC-EL-N6255)
Unclassified report

DESCRIPTORS: *Loran equipment, Inertial navigation, Hyperbolic navigation systems, Loran, Radio equipment, Airborne, Position finding, Navigation computers, Effectiveness, Tests, Radio receivers.

Operational testing and maintenance experience proved the necessity for a simpler and more direct approach in the design of the LORAN-C receiver for use as a navigational aid. It is indicated that increased operational capability can be achieved by automatic and continuous conversion of the LORAN-C hyperbolic time-difference information into the conventional geographic coordinates of latitude-longitude, the continuous panel display of guidance information, and the updating of the dead reckoning computer and/or the inertial guidance system. (Author)

AD-283 060 Div. 19, 6
(TISTA/VGW) OTS price $3.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
ACTIVITY REPORT.
July 62, 25p. incl. illus.
(ESD TDR 62-25) Unclassified report

DESCRIPTORS: *Air traffic control systems, *Runway lights, *Glide path systems, *Radar navigation, Aviation safety, Airport radar systems, Radar equipment, Display systems, Data processing systems.

Contents:
APPROACH AND LANDING SYSTEMS: AN/GSN-5A, BLEU landing system, REGAL, FLARESCAN, and AN/APN-114. AIRPORT LIGHTING SYSTEMS: Sylvania simplified approach lights, centerline taxiway lighting, runway crossbars and distance-to-go signs, shield for approach light sequence flasher, semi-flush mounted runway lights, comparison of U. S. Red-White VGSI and Australian TEE-VGSI, and heliport surface lights. DATA ACQUISITION AND PROCESSING: AN/GSN-11 and data processing central. NAVIGATION: Doppler VOR/TACAN co-location tests, radio doppler direction finding, minimum air navigation, and pictorial displays and course line computers. RESEARCH: ATC concepts for supersonic and hypersonic vehicles, weather hazards detection and circumnavigation, advanced communications techniques for LODISNAV, pilot warning information requirements, Hawaiian Islands ATC simulation study, and water equeezer-type aircraft arresting system. (Author)

# 20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-281 803 Div. 20, 15
(TISTP/WH) OTS price $1.60

Naples U. (Italy).
SELF-COUPLED MESON FIELD. EQUATIONS FOR SINGLE PROPAGATORS, THEIR SOLUTION FOR A NUMERICAL MODEL, CONSIDERATIONS ON THE CONVERGENCE OF PERTURBATIVE EXPANSIONS,
by E. R. Caianiello and A. Campolattaro. July 62, 16p. 10 refs. (Technical note no. 7)
(Contract AF 61(052)434)
Unclassified report

DESCRIPTORS: *Mesons, *Nuclear physics, *Electromagnetic theory, *Differential equations, *Functions, *Series.

It is shown that all the independent equations, or conditions, that can be derived for a single propagation kernel from all the branching equations that connect it and its derivatives with respect to the parameters of the theory with kernels of arbitrarily high order reduce to a small and unique set. It is then shown that whereas the only information one can get from the majoration of a regularized perturbative expansion of the kernels is that all majorants are divergent, a numerical model obtained by imposing that the free propagators in configuration space depend only upon the mass can be exactly solved if these equations are used. One finds that the general solution is a linear combination of hypergeometric functions of the coupling constant l which is singular for l = 0; there is, however, a unique choice of constants which yields a solution regular when l = 0. This model is related to the asymptotic form of the correct theory if the latter is defined over an infinitesimal space-time volume. (Author)

AD-282 098 Div. 20
(TISTP/WH) OTS price $1.60

Paris U. (France).
THOMAS'S CLASSICAL THEORY OF SPIN,
by Henri Bacry. 1 July 62, 12p. 10 refs. (Technical note no. 7)
(Contract AF 61(052)474)
Unclassified report

DESCRIPTORS: *Nuclear spins, *Nuclear magnetic moments, Vector analysis.

Thomas's works on the classical theory of spin is treated. The spin precession equation is generalized for variable electromagnetic fields and in the more general case of a bilocal theory. (Author)

AD-282 109 Div. 20
(TISTP/WH) OTS price $1.60

Paris U. (France).
HYPERFINE STRUCTURE OF MU-MESIC ATOMS,
by Michel Le Bellac. 1 July 62, 19p. incl. illus. table, 14 refs. (Technical note no. 6)
(Contract AF 61(052)474)
Unclassified report

DESCRIPTORS: *Nuclear magnetic moments, *Hyperfine structure, *Mesons, *Atoms.

The effects of the distribution of nuclear magnetization on hyperfine structure (Bohr - Weisskopf effect) are studied in the case of mu-mesic atoms. The 'configuration mixing' model of nucleus is used for the calculation and it is shown that the reduction of hyperfine structure is of order 15% for Al-27 and of order 50% for Bi-209. Calculations are also made in the framework of the collective model again for Al-27 and also for Ta-181. The vacuum polarization effects on hyperfine structure are also studied and are found to be of order 1% for light nuclei. (Author)

AD-282 179 Div. 20, 8
(TISTP/WH) OTS price $1.60

Aerojet-General Nucleonics, San Ramon, Calif.
FEASIBILITY DETERMINATION OF A NUCLEAR THERMIONIC SPACE POWER PLANT.
Quarterly technical progress rept., 1 May-31 July 62.
31 July 62, 12p. incl. illus. 9 refs. (Rept. no. AN-693)
(Contract AF 33(657)8977, Proj. 3145; continuation of Contract AF 33(616)8119)
Unclassified report

DESCRIPTORS: *Nuclear power plants, *Electric power supply, *Thermionic emission, Liquid metals, Heat exchangers, Space flight.

Work is described which is directed toward demonstration of the feasibility of the Nuclear Thermionic Radiator Space Power System. The specific objectives of the current program are: (1) to demonstrate operation of a minimum of three thermionic converters in a series array using heat from a liquid metal loop to heat the cathodes; and, (2) to demonstrate 1000 hours of thermionic operation using liquid metal heating. (Author)

AD-282 197 Div. 20, 25
(TISTP/JW) OTS price $8.10

Kiruna Geophysical Observatory (Sweden).
CORPUSCULAR RADIATION MEASUREMENTS BY 1959 IOTA (EXPLORER VII) RECORDED AT KIRUNA GEOPHYSICAL OBSERVATORY,
by Ludwik Liszka. 20 Jan 62, 1v, incl. illus. 2 refs. (Scientific rept. no. 3)
(Contract AF 61(514)1314)
(AFCRL 62-379) Unclassified report

DESCRIPTORS: *Radiation instruments, *Magnetic effects, Measurement, Geiger counters, Radiation counters, Telemetering, Space environmental conditions, Satellite vehicles.

Data obtained by means of two Geiger counters on Explorer VII were recorded at Kiruna Geophysical Observatory during some 80 transits of the satellite between February 6th and March 2nd, 1961. The radiation measurements have been investigated with respect to the geomagnetic activity and to the geographical position of the satellite. Curves of recorded apparent counting-rates are included. (Author)

AD-282 243 Div. 20
(TISTP/WH) OTS price $5.60

Lund U. (Sweden).
THE RELATIVE ABUNDANCE OF NUCLEI HEAVIER THAN LITHIUM IN PRIMARY COSMIC RADIATION.
Technical rept.,
by K. Kristiansson, O. Mathiesen, and A. Stenman.
June 62, 38p. illus. tables, 37 refs.
(AF EOARDC Grant 61-37)
Unclassified report

DESCRIPTORS: *Nuclei, *Abundance, *Lithium, *Cosmic rays.

The relative abundance of nuclei heavier than lithium in primary cosmic radiation was investi-

gated. Photometric measurements were made on 362 tracks of heavy primary particles ($Z > 3$), which were found in an emulsion stack exposed over Texas at 41 degrees geomagnetic latitude. The measurements have been corrected for different emulsion effects. Results of observations are presented. (Author)

AD-282 315 Div. 20, 25
(TISTP/WH) OTS price $3.60

Aerophysics Lab., Mass. Inst. of Tech., Cambridge.
STUDIES RELATED TO THE GASEOUS QUANTUM COUNTER. Final rept.,
by Arthur Lubin. Sep 61, 31p. incl. illus. table, 14 refs. (Technical rept. no. 8)
(Contracts AF 33(616)7096 and Nonr-184140)
Unclassified report

DESCRIPTORS: *Quantum mechanics, *Infrared detectors, *Electron transition, *Brillouin zones, *Radiation counters, *Gases, Electron guns, Helium.

Progress made in an investigation of the practical limitations to the theoretical potentialities of a gaseous quantum counter is discussed. The GQC is a device which makes use of the stimulated emissions of certain gases. The experimental approach is outlined, and the results of the physical experiment are reported. (Author)

AD-282 403 Div. 20, 8
(TISTP/FR) OTS price $5.60

Bendix Systems Div., Bendix Corp., Ann Arbor, Mich.
STUDY TO DETERMINE EFFECTS OF FISSION PRODUCT GAMMA RADIATION ON ELECTRONIC PARTS AND EQUIPMENT.
Progress rept. no. 1, 1 Mar-31 May 62,
by R. M. Magee. June 62, 53p. incl. illus. tables (Rept. no. BSC-31975)
(Contract NObsr-87267)
Unclassified report

DESCRIPTORS: *Radiation damage, *Printed circuits, Digital computers, Transistors, Diodes, Measurement, Test facilities.

The present effort is concentrated on the Naval Tactical Data System (NTDS). As a start in evaluating the performance of this system in a fission product radiation environment, sixteen circuit cards in the system have been selected which are probably most sensitive to such an environment. These cards will be exposed to a controlled gamma radiation and temperature environment, and their performance will be monitored in this environment. The circuits to be tested, the instrumentation to be used, and the gamma sources which will be used to simulate the fission product transit field are described. (Author)

AD-282 467 Div. 20, 14
(TISTB/AW) OTS price $7.60

North American Aviation, Inc., Downey, Calif.
NUCLEAR RADIATION EFFECTS ON ELASTOMERS.
11 Apr 62, 51p. (Rept. no. SID 62-386)
Unclassified report

DESCRIPTORS: *Elastomers, *Rubber, *Polymers, *Radiation damage, Seals, Gaskets, Spaceships, Aircraft, Space flight, Ionization, Gamma rays, Excitation, Rubber hose, Rubber gaskets, Rubber seals, Urethanes, Plastic gaskets, Plastic seals, Synthetic rubber, Nitrile rubber, Radiation effects.

One hundred seventy-seven references, mainly since 1957, on the damaging effects of nuclear radiation on rubber and other elastometric materials are given. (Author)

AD-282 500 Div. 20, 25
(TISTP/JW) OTS price $2.60

Stanford U., Calif.
ELECTRON SCATTERING AND EFFECTIVE CHARGE,
by J. D. Walecka and R. S. Willey. July 62, 21p. incl. illus. 22 refs. (Technical note no. 68)
(Contract AF 49(638)388)
(AFOSR-3065) Unclassified report

DESCRIPTORS: *Electron diffraction analysis, *Elastic scattering, *Nuclei, Density, Particles, Transmission, Motion, Excitation, Nuclear energy.

The possibility of studying single-particle nuclear transition charge densities with inelastic electron scattering is discussed and it is pointed out that such experiments lead to valuable information about the nature of the effective charge. A few simple calculations of cross sections are carried out for various models of the effective charge and it is shown that the momentum transfer dependence of the cross section distinguishes between them. (Author)

AD-282 615 Div. 20, 15, 25
(TISTP/TL) OTS price $6.60

Stanford U., Calif.
EXCITATION OF INDIVIDUAL-PARTICLE STATES OF NUCLEI BY INELASTIC ELECTRON SCATTERING,
by Raymond S. Willey. July 62, 63p. illus. 44 refs. (Technical note no. 66)
(Contract AF 49(638)388, Proj. 9750-37500)
(AFOSR-3066)
Unclassified report

DESCRIPTORS: *Particles, *Excitation, *Nuclei, *Electrons, *Inelastic scattering, Nuclear structure, Electromagnetic fields, Quantum mechanics, Nuclear spins, Quadrupole moments, Vector analysis, Partial differential equations, Integration, Operators (Mathematics), Matrix algebra, Numerical analysis, Lithium, Oxygen.

Formulas are given for the computation of cross sections for excitation of shell model states in light nuclei by inelastically scattered electrons. The contributions from the transverse electric and magnetic interactions are calculated in detail. The determination of radiative lifetimes by extrapolation of electron scattering data is discussed and found to be model-dependent. Particular calculations are carried out for Li7 and O18. The Li7 calculation provides an example in which the contributions from the transverse interactions are of the same order of magnitude as the contribution from the Coulomb interaction, even at small momentum transfer. In the case of O18, electron scattering experiments may distinguish collective excited states from individual-particle excited states. (Author)

AD-282 727 Div. 20
(TISTP/WH) OTS price $2.60

Aerospace Corp., Los Angeles, Calif.
ISOTOPE EFFECTS AND THE MECHANISM OF ATOM PRODUCTION IN IRRADIATED ICE AT 4.2 K,
by Seymour Siegel, John M. Flournoy, and Henry Judeikis. 26 June 62, 20p. incl. illus. table, 8 refs. (Rept. no. TDR-69(2240-51)TN-1)
(Contract AF 04(695)69; In cooperation with Aerojet-General Corp., Azusa, Calif.)
(DCAS TDR 62-140)
Unclassified report

DESCRIPTORS: *Atomic spectrum, *Nuclear spin, Ice, Deuterium oxide, Low temperature research, Gamma rays.

The relative intensities of the Electron Spin Resonance (ESR) spectra of H and D atoms were determined for mixtures of H2O and D2O which were irradiated and observed at 4.2 K. A careful analysis of the results indicates that the yield of atoms per unit irradiation dosage exhibits no isotope effect, except for the system containing trace amounts of H2O in D2O. The presence of a large isotope effect for a system of D2O containing approximately 0.1 per cent H2O is discussed in terms of energy transfer in the solid state. (Author)

AD-282 753 Div. 20
(TISTP/WH) OTS price $9.60

General Dynamics/Fort Worth, Tex.
EXPERIMENTAL DETERMINATION OF NEUTRON FLUX DISTRIBUTIONS IN SLABS AND OF EMERGENT SECONDARY GAMMA RAYS,
by G. T. Western. June 62, 115p. incl. illus. tables, 13 refs. (Document no. NARF-62-6T; Document no. FZK-9-176)
(Contract AF 33(600)38946)
Unclassified report

DESCRIPTORS: *Neutron flux density, *Gamma neutron reactions, *Shielding, Polymers, Ethylenes, Zirconium, Beryllium compounds, Oxides, Beryllium, Stainless steel.

Neutrons from a shield test reactor, positioned within the Outside ASTR Tank, were deflected 90 deg with a carbon reflector onto shield materials of linear and borated linear polyethylene, ZrH1.95, Inconel X, BeO, Be, and stainless steel (type 309). The emergent flux of various monoenergetic capture gamma rays were experimentally determined for several thicknesses of each material with a special 3-crystal NaI(T lambda) anticoincidence total-absorption gamma-ray spectrometer. Also, the spectrum of neutrons incident upon the shield materials and the flux distribution of thermal neutrons within the material were measured. Neutron spectral and flux distribution data were also obtained for the shield materials positioned in the direct beam of neutrons. (Author)

AD-282 807 Div. 20, 25
(TISTP/JW) OTS price $4.60

Uppsala U. (Sweden).
ORBITAL THEORIES OF ELECTRONIC STRUCTURE,
by William H. Adams. 1 May 62, 34p. 37 refs.
(Technical note no. 76)
(Contract AF 61(052)351)
(ARL 62-400) Unclassified report

DESCRIPTORS: *Atomic energy levels, *Electronic systems, Model tests, Functions, Special functions, Molecules, Linear systems, Optics, Measurement.

It is shown that in the Hartree-Fock approximation there exists a uniquely defined Hermitian potential which describes the interaction of a model subgroup of electrons with the rest of the system. This potential can be divided into two parts. The first part is the difference between the Hartree-Fock Hamiltonian for the system and the model Hamiltonian. The second part is a nonlocal potential which cancels (screens) some of the first part. The essential point in the derivation is the choice of definition for model orbitals in the system. The only condition that must be satisfied by the occupied orbitals of the system is that they be linearly independent. It is also shown that there exist equations describing the best orbitals to use in a calculation by a linear combination of atomic orbitals method. They are the best orbitals to use because they give the exact answer. In order to link this method with others that have been described it is indicated how the pseudopotential form of the orthogonalized plane wave method may be derived. (Author)

AD-282 812 Div. 20
(TISTP/TL) OTS price $1.60

Theoretical Chemistry Lab., U. of Wisconsin, Madison.
THE EFFECTS OF DEGENERACY ON THE INELASTIC SCATTERING OF ELECTRONS AND PROTONS BY HYDROGEN ATOMS.
Rept. on Theoretical Foundations for Properties of High Temperature Gases.
by P. D. Robinson. 2 July 62, 12p. incl. tables, 14 refs. (Rept. no. WIS-AF-22, Series 3)
(Contract AF 33(657)7311, Proj. 1013)
Unclassified report

DESCRIPTORS: *Inelastic scattering, *Electrons, *Protons, *Hydrogen, *Atoms, *Alpha decay, Functions, Spheres, Matrix algebra, Shock waves, Impact, shock, Vector analysis, Proton cross sections, Bombardment, Excitation, Integral equations, Differential equations.

An investigation is made of the effects of 2s:2p degeneracy on cross-sections for the 1s→2p and 1s→2s excitation of hydrogen atoms by electron and proton impact. The initial relative energy ranges considered are 10.2 to 50 e.v. for electrons and 0.25 to 50 k.e.v. for protons. A simple rotating axis approximation of Bates is employed, and the degeneracy is allowed for by using spheroidal atomic wave functions in the matrix elements rather than pure 2s or 2p functions. These spheroidal functions are varying linear combinations of 2s and 2p, and are the correct zero-order functions for the atom perturbed by a charged particle. The degeneracy effects are measured by comparing the direct cross-sections found using the pure 2s and 2p functions with the indirect cross-sections obtained from the spheroidal functions. The indirect results are quite different from the direct ones for slow collisions, both for electron and for proton impact. (Author)

AD-282 854 Div. 20
(TISTP/TL) OTS price $1.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
DYNAMIC CROSSED-FIELD ELECTRON MULTIPLICATION,
by Don F. Holshouser. 1962, 10p. incl. illus. tables, refs.
(Contract AF 49(638)556)
(AFOSR TN 60-142) Unclassified report

DESCRIPTORS: *Electrons, *Electron multipliers, *Secondary emission, *Mathematical analysis, *Electrodes, Geometry, Ultra high frequency, Electric fields, Magnetic fields, Surfaces, Microwaves, Atomic orbitals, Velocity.

A method of secondary-electron multiplication, employing a UHF or a microwave electric field in combination with a steady magnetic field and a single secondary-emitting surface, is described. Electrons which are emitted from the surface gain energy from the electric field and, through the action of the magnetic field, return to the same surface at phases and energies such as to produce more secondary electrons, which execute similar trajectories. The number of multiplication steps between two points on

the emitting surface is controlled by adjustment of the fields. A phase-focussing action, dependent upon the magnetic field, limits the transit-time spread of electrons. The relations between arrival time and departure time of electrons are discussed. The effect of initial electron velocity is described. Possible applications of the unique properties of this multiplication method are mentioned. (Author)

AD-282 968 Div. 20
(TISTP/WH) OTS price $15.00

Harvard U. Div. of Engineering and Applied Physics, Cambridge, Mass.
TRUNCATION ERRORS IN NUMERICAL SOLUTIONS OF THE TRANSPORT EQUATION.
Doctoral thesis,
by John H. Bennett. May 62, 1v. incl. illus. tables, 93 refs.
(Contract Nonr-186634)
Unclassified report

DESCRIPTORS: *Neutrons, *Transport properties *Scattering, *Critical assemblies, *Numerical methods and procedures.

The numerical solution is given of the transport equation for monoenergetic neutrons in a medium with isotropic scattering. The object is to determine the accuracy of the numerical methods generally used to solve the transport equation. The analysis is largely confined to the solution of the criticality problem for homogeneous slabs. A criticality problem in X-Y geometry is also considered. The criterion of accuracy used is the difference between c, the number of secondary neutrons per collision required for criticality, and an approximation to c given by an N-parameter approximate method. (Author)

AD-283 014 Div. 20
(TISTP/WH) OTS price $4.60

California U., Berkeley.
NUCLEAR DOUBLE RESONANCE IN THE ROTATING FRAME.
Doctoral thesis,
by S. R. Hartmann and E. L. Hahn. 1962, 37p. illus. 22 refs.
(Sponsored by National Science Foundation and Office of Naval Research)
Unclassified report

DESCRIPTORS: *Nuclear resonance, *Nuclear magnetic dipole moments, *Nuclear physics.

A double nuclear resonance spectroscopy method is introduced which depends upon effects of magnetic dipole-dipole coupling between two different nuclear species. (Author)

AD-283 022 Div. 20
(TISTP/WH) OTS price $13.00

Illinois U., Urbana.
PHOTOPRODUCTION OF 42.4 MEV POSITIVE PIONS FROM HYDROGEN AT LABORATORY ANGLES BETWEEN 50 AND 170 DEGREES,
by Paul M. Baum and Clark S. Robinson. July 62, 171p. incl. illus. tables, 53 refs. (Technical rept. no. 40)
(Contract Nonr-183405)
Unclassified report

DESCRIPTORS: *Photonuclear reactions, *Pions, *Differential cross sections, *Hydrogen.

Relative differential cross sections for the photoproduction of 42.4 Mev pi(+) mesons from hydrogen were measured at 12 laboratory angles between 50 and 170 deg. The experimental cross sections obtained were compared with the predictions of the dispersion theory of Chew, Goldberger, Low, and Nambu (CGLN). It is found that an appreciable discrepancy exists. When the experimental results are normalized to the theoretical cross section at the smallest angle, the theoretical values at large angles are about 28% higher than the experimental values. Comparison with theoretical results of McKinley shows that the data can be fitted quite well by using a rho-meson coupling constant lambda/ef = -1.2 ± 0.4. The uncertainty in lambda is due to the uncertainty in the phase shifts appearing in the photoproduction amplitude. (Author)

## 21. NUCLEAR PROPULSION

AD-281 853 Div. 21, 27
(TISTP/WH) OTS price $2.60

Aerospace Information Div., Washington, D. C.
SOVIET NUCLEAR INSTRUMENTATION AND CONTROL FOR PROPULSION.
Quarterly rept. no. 10 for period ending 1 June 62.
25 June 62, 19p. incl. illus. 15 refs. (AID rept. no. 62-80)
Unclassified report

DESCRIPTORS: *Nuclear propulsion, *Instrumentation, *Scintillation counters, Electronic equipment, Bibliography, USSR.

Contents:
Electronic equipment
Detectors
Electromechanical control components
Pneumatic control components
Miscellaneous related subjects

## 22. ORDNANCE

AD-281 759 Div. 22
(TISTW/PCR) OTS price $1.60

North Carolina State Coll., Raleigh.
STUDY OF THE GUN-BOOSTED ROCKET SYSTEM.
Monthly progress rept. no. 5, 1-30 June 62,
by R. C. Bullock. June 62, 3 refs.
(Contract DA 01-009-ORD-1022, Proj. 5W17-04-002)
Unclassified report

DESCRIPTORS: *Artillery rockets, Dynamics, Equations, Theory, Gravity, Spin stabilized ammunition, Fin stabilized ammunition, Gun launched.

Theoretical and computational treatment of rocket motion during the tipoff period is presented for conventional artillery rockets and for gun-boosted artillery rockets, both spin-stabilized and fin stabilized.

AD-281 845 Div. 22, 30
(TISTW/JRG) OTS price $1.60

Naval Ordnance Lab., White Oak, Md.
THE JOURNAL OF THE JANAF FUZE COMMITTEE (JOINT ARMY-NAVY-AIR FORCE). SCOPE, PURPOSE AND USE

OF MILITARY STANDARDS FOR FUZES,
by A. W. Baldwin. 15 Feb 62, 13p. incl. 4 refs. (Serial no. 24)
Unclassified report

DESCRIPTORS: *Fuzes, *Projectile fuzes, *Rocket fuzes, *Time delay fuzes, Test methods, Standards.

Military standards for use in development and production of fuzes have been prepared by the Joint Army, Navy, and Air Force (JANAF) Fuze Committee. Those field and laboratory tests which are used frequently and are applicable to a specific type of fuze or to several types of fuzes have been published so that the tests may be conducted in the same manner regardless of where the work is performed. Test laboratories using the standard tests have produced data which can be interpreted by all other fuze laboratories; therefore, the repetition of similar tests has been reduced when a fuze developed by one service is adopted by another. Special tests for unusual fuzes or components are still necessary. (Author)

AD-281 875 Div. 22
(TISTW/PCR) OTS price $1.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A METHOD FOR DETERMINING ESTIMATES OF THE DYNAMIC UNBALANCE AND THE THRUST MISALIGNMENT OF SPIN-STABILIZED ROCKETS,
by W. J. Sacco. May 62, 20p. incl. illus. 3 refs. (Memo. rept. no. 1405)
(Proj. 503-06-002)
Unclassified report

DESCRIPTORS: *Rockets, *Spin stabilized ammunition, Thrust, Dynamics, Artillery rockets, Equations, Motion, Differential equations

Solutions to the equation of motion of a spinner artillery rocket about its center of gravity under the influence of thrust misalignment and dynamic unbalance are obtained. A method for determining effective values of dynamic unbalance and thrust misalignment is given. (Author)

AD-281 926 Div. 22
(TISTW/DLW) OTS price $5.60

General Electric Co., Burlington, Vt.
PROJECT VULCAN RESEARCH AND DEVELOPMENT.
Progress rept. no. 34, 1 Apr-31 May 62,
by R. H. Barrett. 30 June 62, 53p. incl. illus.
(Rept. no. 61-APB-769-34)
(Contract DA 19-020-ORD-5455)
Unclassified report

DESCRIPTORS: *Aircraft guns, *Automatic weapons, Cams, Bolts, Boresighting, Stability, Tests, Design, Airborne.

Contents:
Improved part life
MIL-L-46,000 with 20% Teflon #5
Cycloidal cam configuration
Bolt roller shafts
Boresighting and target study
Production gun data
Dispersion
Gun components
Muzzle clamp lock
Sector cam hold-down spring
Universal guide bar
Hi-strength bolts
Improved bolt body track lugs
Bolt body insulation
Range firing records

AD-281 937 Div. 22
(TISTW/RB) OTS price $1.60

Naval Propellant Plant, Indian Head, Md.
AN APPARATUS FOR THE DIFFERENTIAL THERMAL ANALYSIS OF EXPLOSIVES,
by M. E. Baicar, W. G. Gough, and E. F. Hare. 8 Dec 61, 13p. incl. illus. 4 refs. (Technical rept. no. 114)
(NavWeps rept. no. 7107)
Unclassified report

DESCRIPTORS: *Explosives, Ammonium radicals, Nitrates, Perchlorates, Heat, Analysis, Instrumentation, Thermodynamics, Entropy, Ovens.

A differential thermal analysis apparatus has been designed and constructed at the Naval Propellant Plant for use in studying either ground (2.5 g) or right-cylinder (1/2 to 2 in.) propellant samples. Heating rate is 0.50 ± 0.02 C/minute. One feature of this apparatus is the aluminum-foil-covered asbestos oven with a blow-off top. This top plus the fact that the sample holders reduce to dust upon detonation make the replacement of the oven an extremely rare occurrence. Should the oven have to be replaced, however, the cost is only about $100.00. (Author)

AD-282 088 Div. 22
(TISTW/RD) OTS price $4.60

Illinois U., Urbana.
TORSIONAL OSCILLATIONS OF A GUN BARREL.
Final technical rept. on Artillery Carriage Dynamics Study,
by T. Smith. July 62, 34p. incl. illus. table, 2 refs; (T and AM rept. no. 220)
(Contract DA 11-022-508-ORD-3505, DA Proj. 5W01-01-034)
Unclassified report

DESCRIPTORS: *Gun barrels, Motion, Equations, Integral equations, Functions, Mathematical analysis, Differential equations, Moments, Partial differential equations, Numerical analysis, Oscillation.

An analysis is presented of the torsional oscillations of an artillery barrel when subjected to the moment of an accelerating projectile. A modal series is obtained, the coefficients of which are the time dependent generalized coordinates. For purposes of obtaining numerical results, this series was truncated at two terms; the subsequent system of ordinary differential equations was programmed for the analog computer. Graphic solutions are given for several values of the barrel size to projectile mass ratio. (Author)

AD-282 209 Div. 22
(TISTW/EET) OTS price $4.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
CORIOLIS EFFECTS ON THE AEROBEE-HI SOUNDING ROCKET,
by Larry E. Traylor. Aug 62, 42p. incl. illus. tables, 4 refs. (Technical rept. MM-459)
Unclassified report

DESCRIPTORS: *Sounding rockets, *Rocket trajectories, Rockets, Centrifugal fields, Acceleration, Rotation, Motion, Launching, Azimuth, Differential equations, Mathematical prediction, Digital computers, Ballistics.

A discussion of the Coriolis and other rotational effects on the impact of the Aerobee-Hi research rocket, including derivations, calculation

procedures, and results is presented. A comparison between the method for computing these effects recommended herein and the method which has been in use for this rocket is also included. (Author)

AD-282 257 Div. 22
(TISTW/EET) OTS price $9.60

Kearfott Div., General Precision, Inc., Little Falls, N. J.
GYROSCOPIC AIMING DEVICE FOR A SELF-PROPELLED ARTILLERY WEAPON.
Final engineering rept.,
by J. P. Sputz. Mar 62, 114p. incl. illus. table (Rept. no. M60003)
(Contract DA 30-069-507-ORD-2762)
Unclassified report

DESCRIPTORS: *Self-propelled guns, *Gyroscopes, *Gyroscopic sights, Automatic, Instrumentation, Control panels, Power supplies, Electronic equipment, Compasses, Accelerometers, Azimuth, Analog computers, Tests, Design.

The gyroscopic aiming device (GYRAD) was designed and developed to meet the need for a faster and more accurate method of orienting and laying artillery in azimuth and elevation. Designed to be mounted on a non-rigid base, it is automatic, self-contained and requires no external information other than an approximate indication of latitude. The GYRAD was designed to lay an artillery weapon in azimuth within ± 1 mil at a latitude of 45 deg. At any latitude between 75 deg North and 75 deg South, the system operates effectively and provides reliable data. The GYRAD consists of four major components: stable platform, control electronics, power supply, and control panel. A brief description of each of these components is given. (Author)

AD-282 305 Div. 22, 15
(TISTW/EET) OTS price $4.60

Illinois U., Urbana.
BALLISTIC EQUATIONS FOR ARTILLERY SHELLS.
Rept. on Artillery Carriage Dynamics,
by E. V. Wilms. July 62, 44p. 2 refs. (T and AM rept. no. 620)
(Contract DA 11-022-508-ORD-3505, Proj. 5W01-01-034)
Unclassified report

DESCRIPTORS: *Projectiles, *Projectile trajectories, Equations, Motion, Wind, Earth, Rotation, Vector analysis, Mathematical analysis, Moments, Gravity, Transformations (Mathematics), Computers, Artillery, Differential equations, Exterior ballistics.

A set of equations describing the motion of artillery shells for convenient solution by computer is derived. The effect of mass unbalance is taken into account. The equations are set up in an inertial coordinate system, and the effect of the rotation of the earth is included. (Author)

AD-282 492 Div. 22
(TISTW/PCR) OTS price $2.60

Remington Arms Co., Inc., Bridgeport, Conn.
DEVELOPMENT AND MANUFACTURE OF SPECIAL CALIBER .30 ELECTRIC PRIMERS.
Final summary rept., Mar 61-Mar 62,
by Fred Senko and Theodore B. Johnson.
18 July 62, 21p. incl. illus. tables.
(Rept. no. AB-62-7)
(Contract DA 19-020-ORD-5379, Proj. TN 1-2707)
Unclassified report

DESCRIPTORS: *Primers, *Electric primers, Explosives, Resistance, Sensitivity, Time.

Tests were made on Type T2, normally closed, explosive switch to improve switch opening characteristics. This type of switch is fired by the explosive action of a special electric primer. Brisance of the primer and the electrical resistance of the primer residue were both increased. Quantity of primer residue was decreased. Sensitivity and functioning time of the primer remain satisfactory. (Author)

AD-282 530 Div. 22
(TISTW/PCR) OTS price $4.60

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
DEVELOPMENT OF THRUSTER, CARTRIDGE ACTUATED, XM14,
by C. Glaser. May 62, 47p. incl. illus. tables.
(Technical rept. no. R-1635)
Unclassified report

DESCRIPTORS: *Explosive actuators, Cartridges, Rammers, Design, Tests.

A propellant actuated device, designated the XM14 Cartridge Actuated Thruster, was developed to act as a rammer for the 155 mm howitzer used in the T196 tank. This comprised a receiver and a modification of the qualified M19 Thruster. Requirements for this thruster differed from those normally specified for propellant actuated devices in that the unit was required to fire repeatedly without maintenance. Design studies were initiated by conducting tests with the M19 thruster, modified to accept the firing mechanism of a standard rifle, which utilizes a standard cartridge. The thruster was modified until it met or exceeded all performance requirements. A final engineering evaluation program confirmed the practicability of this device. (Author)

AD-282 644 Div. 22
(TISTW/EET) OTS price $2.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
PRE-LAUNCH REAL-TIME ROCKET IMPACT PREDICTION SYSTEM AT WHITE SANDS MISSILE RANGE,
by Henry Rachele. Aug 62, 21p. incl. illus. 34 refs. (Technical rept. no. MM-461)
Unclassified report

DESCRIPTORS: *Sounding rockets, Launching, Wind, Velocity, Measurement, Digital computers, Mathematical prediction, Meteorological data, Balloons, Television cameras, Radar equipment, Radar tracking, Search radar, Data transmission systems, Rocket launchers, Terminal ballistics, Ballistics.

A general description is given of a nearly automatic data collection, transmission and ballistic calculation system which will be used for prelaunch impact prediction of unguided high altitude rockets to be fired at White Sands Missile Range. From a ballistic standpoint the use of an Automatic Rocket Impact Predictor (ARIP) and high-speed computer are emphasized; from a wind standpoint, emphasis is given to the use of a 500-foot wind tower and an automatic television tracking pilot balloon wind measuring system since winds near the surface are of special concern when firing rockets from short or zero-length launchers to high altitudes. Drawings of the system and various components are included. (Author)

# Division 22 - ORDNANCE

AD-282 666 Div. 22
(TISTW/PCR) OTS price $3.60

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
COMBUSTIBLE AMMUNITION FOR SMALL ARMS. II. DEVELOPMENT OF A COMBUSTIBLE SMALL ARMS CARTRIDGE,
by E. F. Van Artsdalen and J. B. Quinlan.
June 62, 37p. incl. illus. tables, 2 refs.
(Rept. no. R-1643)
(Proj. 504-05-002)
Unclassified report

DESCRIPTORS: *Cartridges, Cartridge cases, Molding materials, Propellants, Primers, Ballistics, Velocity, Styphnates, Ignition, Moisture, Coatings, Shear stresses, Tensile properties, Temperature, Nitrocellulose, Nitroglycerin, Camphors, Propellant flashes, Sensitivity, Physical properties, Small arms ammunition.

Combustible 7.62 mm ammunition, consisting of a molded integral propellant charge and a dual primer, was developed. When fired in a self-obturating 7.62 mm test weapon over the temperature range -65 to 160 F, this cartridge yielded mean ballistic performance similar to that obtained with the standard M59 metal cased cartridge. Velocity reproducibility, however, was poorer than that obtained with the standard cartridge. Accuracy was slightly less with the combustible ammunition. The combustible dual primer, which consisted of a percussion sensitive cap and a pellet of standard styphnate primer mixture, provided adequate and reproducible ignition. Molded charges had a considerable degree of inherent moisture resistance. Water immersion tests revealed no substantial changes in velocity or pressure after ten months exposure. Firings were conducted with molded charges coated with various materials to determine the degree of consumption of the coatings. All coatings were consumed. (Author)

AD-282 714 Div. 22
(TISTW/RD) OTS price $3.60

Denver Research Inst., Colo.
BLAST AND FRAGMENT CHARACTERISTICS AROUND JET PERFORATOR X442.
Progress and fund rept. no. 13, 1 Mar-31 May 62,
by John Wisotski. 19 June 62, 33p. incl. illus. tables.
(Contract DAI 23-072-501-ORD(P)-35)
Unclassified report

DESCRIPTORS: *Explosives, *Rocket launchers, Blast, Fragmentation, Arctic regions, Shock waves, Pressure, Jets, Cratering, Postholes, Surface targets, Paper, Terminal ballistics, Penetration, Installation.

An investigation is described of the Jet Perforator X442 considered for use in the arctic-tie-down kit for the Littlejohn launcher. Both blast and fragmentation data were obtained from the rounds fired in the test program. The data will be used to aid in the determination of the lethal range of fragments, debris and blast from the firing of a Jet Peforator. (Author)

AD-282 977 Div. 22, 20
(TISTW/JRG) OTS price $5.60

Rocketdyne, Canoga Park, Calif.
INVESTIGATION OF A LINED-CAVITY DESTRUCT CHARGE CONCEPT.
Final rept.,
by E. E. Lockwood. 6 Aug 62, 47p. incl. illus. table, 12 refs. (Rept. no. R-3731)
Unclassified report

DESCRIPTORS: *Shaped charges, *Destructors, *Nuclear power plants, Airborne, Cavity liners, Safety devices, Guided missiles, Satellite vehicles, Steel, Metal plates, Penetration, Tests, Demolitions, Auxiliary power plants.

A brief literature survey and experimental program was conducted to demonstrate the feasibility of utilizing a lined-cavity explosive destruct charge (shaped charge) concept for the airborne Small Nuclear Auxiliary Power (SNAP) reactor. Linear shaped-charge penetration tests were conducted against 1-in.-thick steel witness plate to optimize the charge configuration. A circular (continuous ring) shaped charge was then constructed and tested against a reactor mockup vessel. Satisfactory demonstration of the ring charge concept was achieved. The optimum charge configuration contained a linear explosive loading of 0.5 lb/ft. (Author)

AD-283 016 Div. 22
(TISTW/EET) OTS price $7.60

Army Engineer Research and Development Labs., Fort Belvoir, Va.
IMPROVISED SHAPED CHARGES WITH PASTE EXPLOSIVE FILLER,
by Jamesa A. Dennis. 19 Mar 62, 64p. incl. illus. tables, 9 refs. (Technical rept. no. 1710-TR)
Unclassified report

DESCRIPTORS: *Plastic explosives, *Shaped charges, *Cavity liners, Explosives, Detonators, Penetration, Steel, Targets, RDX, Tests, Effectiveness.

Tests were conducted to determine the effectiveness of RDX base paste explosive as the explosive filler for improvised shaped charges. The performance of hand-formed and precision manufactured cavity liners was also evaluated. The shaped charge parameters investigated were: type of explosive filler, explosive loaded height above liner vertex, type of conical liner, and standoff distance. The tests were designed as a full factorial experiment, and the results were analyzed by the analysis of variance. Seventy-four improvised shaped charges were fabricated in the field and fired into a target stack of steel plates. Measurements were recorded of the depths of penetration and volumes of the resulting holes in the target. A controlled comparison was made of the shaped charges loaded with Composition C-4 and shaped charges loaded with paste as well as the other charge variables tested. It was concluded that paste explosive is an effective explosive filler for improvised shaped charges. (Author)

AD-283 071 Div. 22
(TISTW/RD) OTS price $4.60

Hayes International Corp., Birminghah, Ala.
STUDY OF TARGET PENETRATION PREDICTION BY HIGH SPEED AND ULTRA HIGH SPEED BALLISTIC IMPACT.
Quarterly rept. no. 4, 1 Apr-30 June 62.
Aug 62, 40p. incl. illus. tables, 13 refs.
(Contract AF 08(635)2155, Proj. 9860)
(APGC TDR 62-51) Unclassified report

DESCRIPTORS: *Hypervelocity projectiles, *Terminal ballistics, Ballistics, Penetration, Targets, Statistical analysis, Stresses, Mathematical prediction, Cratering, Digital computers, Velocity.

A statistical analysis of the penetration depth in semi-infinite targets divided by the diameter of the projectile on 1272 experimental shots has been completed. This data was split into 985 low velocity shots and 297 high velocity shots according to the bulk wave velocity in the target

material. Separate analyses of the two groups show interesting relationships with existing theoretical and empirical equations. A semi-rational penetration expression has been developed from a work-energy consideration which suggests that the nonrecoverable target compression and shear strain energies may account for most of the kinetic energy of the projectile. Judging from a preliminary comparison with existing experimental data, a penetration model of the form developed shows some promise for predicting impact behavior over a wide velocity range and for different projectile and target materials. (Author)

## 23. PERSONNEL AND TRAINING

AD-282 029 Div. 23, 28
(TISTB/AW) OTS price $2.60

Army Personnel Research Office, Office of the Chief, Research and Development, Washington, D.C.
MONITOR PERFORMANCE TASK.
Status rept. for 30 June 62,
by D. A. Dobbins. June 62, 20p. incl. illus.
(Technical research rept. no. 1123)
(DA Proj. 0J95-60-001)
Unclassified report

DESCRIPTORS: *Attention, *Motor vehicle operators, *Radar operators, Military personnel, Selection, Radar tracking, Instrument panels, Radar signals, Auditory signals, Visual signals, Laboratories, Design.

The primary objective is to improve performance in U. S. Army monitor jobs, with special emphasis on developing and testing new work methods for use in operational man-machine systems. Psychological problem areas include vigilance and information processing. The task is divided into three subtasks. The first subtask a study of vigilance under field conditions conducted in cooperation with the American Association of State Highway Officials (AASHO), was completed during FY 1962. The second subtask, 'Experimental Laboratory Studies of Vigilance Behavior,' is still primarily in the planning stage. Most of the groundwork has been completed. The third subtask, 'Human Factors Studies of Critical Jobs in the Operational Setting,' was developed to study operational human factors problems of the Army Security Agency. Most of FY 1962 effort on the third subtask was spent in developing appropriate research methods; data collection is expected to begin in the first quarter of FY 1963 after a series of pilot studies has been completed. (Author)

AD-282 121 Div. 23
(TISTB/MS) OTS price $2.60

Army Personnel Research Office, Office of the Chief, Research and Development, Washington, D. C.
TRACKING PERFORMANCE IN THE MISSILE MASTER-TARGET LOAD, TRACKING TIME, AND RATED PROFICIENCY,
Rept. on Identification of Effective Techniques and Procedures for Target Tracking and Radar Data Processing,
by Seymour Ringel and Paul F. Smith. May 62, 19p. incl. illus. tables, 3 refs. (Technical research note no. 121)
(DA Proj. 0J 95-60-001)
Unclassified report

DESCRIPTORS: *Radar operators, *Radar tracking, *Military personnel, Effectiveness, Tests, Selection.

To explore the effects of target load, duration of tracking time, and tracker proficiency upon tracking performance in the Missile Master system, trackers of high, average, and low rated proficiency were required to track real targets on operational tracking consoles. Tracking performance during six contiguous 10-minute periods was recorded photographically. The number of targets assigned to be tracked varied from 3 to 18 for the six periods. Accuracy indexes were computed--percentage of instances trackers' 'tags' were found on target and number of targets tracked with perfect accuracy in relation to number assigned. No statistically significant differences in tracking performance were found among groups differing in rate proficiency nor across time periods. Within 10-minute periods, a small decrement in mean accuracy score was found. Mean accuracy score and mean percentage of targets tracked with perfect accuracy decreased as target load increased. However, the average number of targets tracked with perfect accuracy increased with increased target load. Individual trackers were found to differ appreciably in performance. (Author)

AD-282 122 Div. 23
(TISTB/AW) OTS price $1.60

Army Personnel Research Office, Office of the Chief, Research and Development, Washington, D. C.
ATTRITION REDUCTION TASK--STATUS REPORT, 30 JUNE 1962,
by William H. Helme and Aaron Katz. June 62, 8p. incl. 17 refs. (Technical research rept. no. 1124)
(DA Proj. 0J95-60-001)
Unclassified report

DESCRIPTORS: *Military training, *Military personnel, Classification, Selection, Aptitude tests, Vocational tests, Effectiveness, Analysis, Personality, Women.

The primary objective of the Attrition Reduction Task is to improve procedures for identifying men who will succeed in training for critical jobs and technical specialties. The task is built upon the foundations of selection and classification research in the earlier tasks of technical ability and school and job success. Three separate, but related, approaches to the objective were pursued: (1) Continued evaluation of the operational effectiveness of Army Classification Battery (ACB) measures and aptitude area composites. (2) Study to identify personality factors leading to attrition during training and to underachievement in training or job, that is, achievement below the level to be expected in view of measured capabilities. (3) Research to improve the utilization of WAC personnel. (Author)

AD-282 421 Div. 23, 28
(TISTB/AW) OTS price $2.60

Harvard U. Graduate School of Education, Cambridge, Mass.
VOCATIONAL SELF CONCEPTS AND HIGH SCHOOL ACHIEVEMENT,
by Robert P. O'Hara. Feb 62, 27p. incl. tables, 27 refs. (Technical rept. no. 19; Harvard Studies in Career Development no. 22)
(Contract Nonr-186631)
Unclassified report

DESCRIPTORS: *Education, *Vocational tests, Aptitude tests, Achievement tests, Intelligence tests, Students, Theory, Analysis.

Super's general theoretical proposition (1951) that vocational development is essentially a

process of implementing a self concept was investigated. To find that self concepts do clarify over the four-year span was the first step in a progressive analysis of vocational self concepts. The next step was to determine if, and to what degree, vocational self concepts were related to vocational developmental tasks. The major hypothesis of this study is that vocational self concepts are significantly related to achievement in high school. Some results were that self ratings of vocational attributes are significantly related to the vocational developmental task of achievement in a college preparatory course in high school; significant correlations between aptitude test scores and achievement occurred more frequently than did significant correlations between interest-value scores and achievement; significant correlations between self ratings on the interest-value scales and achievement occurred more frequently than did significant correlations between self ratings of aptitude and achievement; with one major exception correlations between achievement and test scores are higher than correlations between achievement and self ratings. (Author)

AD-282 428 Div. 23, 28
(TISTB/AW) OTS price $2.60

Harvard U. Graduate School of Education, Cambridge, Mass.
THE AUTOBIOGRAPHY AND VOCATIONAL DEVELOPMENT. Rept. on the Autobiography in the Prediction of College Field of Concentration,
by Ernest B. Walston. Dec 61, 20p. incl. table, 20 refs. (Technical rept. no. 18; Harvard Studies in Career Development no. 21)
(Contract Nonr-186631)
Unclassified report

DESCRIPTORS: *Vocational tests, *Psychometrics, Personality, Attitudes, Effectiveness, Theory, Analysis, Students, Education.

The autobiography as a counseling aid in vocational development is studied. Its predictive efficiency is compared with test data which are known to be predictive of the college major. Results indicate that reference patterns developed from student autobiographies could be used with other tests as a predictive index of vocational development.

AD-282 533 Div. 23, 28
(TISTB/CCH) OTS price $3.60

Harvard U. Graduate School of Education, Cambridge, Mass.
THE IMPRINTING OF ATTITUDES TOWARDS CAREER AND MARRIAGE UPON THE LIFE STYLES OF YOUNG WOMEN,
by Esther Matthews and David V. Tiedeman. Feb 62, 22p. tables, 10 refs. (Technical rept. no. 15; Harvard Studies in Career Development no. 18)
(Contract Nonr-186631)
Unclassified report

DESCRIPTORS: *Women, *Education, Attitudes, Sociology, Psychometrics.

AD-282 794 Div. 23
(TISTB/AW) OTS price $6.60

Psychological Service of Pittsburgh, Pa.
THE EVALUATION OF SELECTION SYSTEMS: STATEMENT OF THE PROBLEM AND PROCEDURES FOR SOLVING IT. Final rept.,
by Ray C. Hackman. Aug 62, 61p. incl. tables, 13 refs.
(Contract Nonr-281000)
Unclassified report

DESCRIPTORS: *Vocational tests, *Personnel, *Selection, *Recruiting, Needs, Analysis, Stimulation, Behavior, Personality, Theory, Job analysis, Management engineering, Psychometrics.

An attempt was made to develop a model or theory of industrial motivation and to investigate the practical implications of the theory as far as developing descriptive measures which could be used to forecast what management calls the will to work. A description of selection activities as a support system to a line production system is discussed. Associated with this are suggestions regarding criteria on the basis of which selection systems can be evaluated. A further development and evaluation of the theory of motivation previously reported is dealt with. The selection implications of the motivation model and the problem of developing instruments on the basis of which the motivation of a potential worker can be described are discussed. (Author)

AD-283 105 Div. 23
(TISTB/AW) OTS price $6.60

New York U. Coll. of Engineering, N. Y.
EFFECTS OF INDUCED-STRESS ON LEARNING PERFORMANCE,
by Sol Klier. 22 Mar 62, 61p. incl. illus. tables, 5 refs.
(Contract N61339-565)
(NAVTRADEVCEN 565-2) Unclassified report

DESCRIPTORS: *Military training, *Stress (Psychology), *Learning, Transfer of training, Effectiveness, Shock, Conditioned reflex, Combat, Stress (Psychology).

Various aspects of an imposed stressful factor in a learning situation were investigated. Three experiments were conducted. The first experiment was concerned with validating the use of electric shock as a stressing agent through the measurement of physiological changes, and with the effect of electric shock during learning and performance. The second experiment concerned the effect of introducing electric shock at various stages of a learning task. The third experiment was divided into two parts. In Part I the effect on learning a maze under stress of varying amounts of pre-stress training on a similar task was studied. Part II investigated the effects of Part I experience for the same subjects in a non-stress, a shock, and a failure-threat situation a few weeks later. Results indicate that the introduction of stress during learning causes adaptation to the stressful effects. This adaptation carries over to a later situation where both the same type of stress and a different type are encountered. (Author)

## 24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-282 536 Div. 24, 2, 18
(TISTA/VGW) OTS price $13.00

Itek Labs., Palo Alto, Calif.
PHOTOGRAPHIC AND PHOTOGRAMMETRIC METHODS OF TERRAIN ANALYSIS FOR DETERMINATION OF AIRCRAFT LANDING SITES.
Final rept.,
8 June 62, 173p. incl. illus.
(Contract AF 19(628)277, Proj. 8623)
(AFCRL 62-644) Unclassified report

DESCRIPTORS: *Photo interpretation, *Terrain, *Landing fields, Stereoscopes, Stereoscopic vision, Aerial photography, Photo interpretability, Effectiveness, Photographic intelligence, Errors, Aerial cameras, Infrared photography, Spectrographic cameras, Test methods, Surface properties, Aerial reconnaissance.

An investigation was made of several terrain analysis systems and techniques designed to evaluate the suitability of land areas for aircraft landing operations. The investigations encompassed stereophotographic systems, including photographic interpretation and stereophotogrammetry, and spectral reconnaissance systems, including infrared detectors and spectral cameras. Recommendations are given for a program designed to test the performance of the equipment and techniques developed. (Author)

AD-282 612 Div. 24, 2, 30
(TISTA/VGW) OTS price $8.60

IBM Command Control Center, Federal Systems Div., Kingston, N. Y.
RESEARCH ON THE PROCESSING OF SATELLITE PHOTOGRAPHY BY DIGITAL TECHNIQUES.
Final rept.,
by R. E. Mach. 30 June 62, 95p. incl. illus.
(Contract AF 19(604)8432, Proj. 6698)
(AFCRL TR 62-822) Unclassified report

DESCRIPTORS: *Television display systems, *Optical images, *Rectifiers (Photography), *Clouds, *Digital systems, Satellite vehicles, Meteorology, Electronic scanners, Photographic recording systems, Automatic, Mapping, Data processing systems.

A three part study of the application of digital techniques to the processing of TIROS I Weather Satellite images is reported. Aspects of the study include: (1) development of a digital method to rectify TIROS images to a Mercator projection; (2) incorporation of latitude and longitude grid lines on the rectified images; and (3) an automatic digital method to assemble overlapping images into a single mosaic. A description of how images were converted to digital data is presented. The philosophies of the computer programs are discussed. Quality, accuracy, and processing time requirements are analyzed. Sample results are shown. Equipment configurations suitable for operational generation of digital data, and reproduction of images from digital data are considered. (Author)

AD-282 678 Div. 24, 18
(TISTA/VGW) OTS price $4.60

Tactical Air Command, Langley Air Force Base, Va.
OPERATIONAL TEST AND EVALUATION FAIRCHILD F-415A (MODIFIED) PANORAMIC CAMERA,
by J. H. Moore. Aug 62, 46p. incl. illus.
(Rept. no. TAC-TR-62-10)
Unclassified report

DESCRIPTORS: *Aerial cameras, *Aerial reconnaissance, *Aerial photography, Flight testing, Effectiveness, Design, Panoramic scanners, Photo interpretability.

Flight tests are reported of the KA-52 camera, designed to provide low altitude, high speed, horizon-to-horizon panoramic photography for tactical aerial reconnaissance. The KA-52 camera produced excellent panoramic type photography at very low altitudes and high ground speeds. Although some malfunctions occurred and several design deficiencies were noted, the mechanical operation was excellent. The deficiencies and the malfunctions were generally minor. Photography obtained from medium and high altitudes was less satisfactory than at altitudes below 1000 ft. The most serious malfunction encountered was a series of film jams in the latter phases of the test. (Author)

# 25. PHYSICS

AD-281 716 Div. 25
(TISTP/WH) OTS price $2.60

Boeing Scientific Research Labs., Seattle, Wash.
INFLUENCE OF THE CRYSTAL FIELD ON THE ION-CORE STATES OF LITHIUM, SODIUM, AND POTASSIUM,
by Joachim C. Erdmann. May 62, 26p. incl. illus. tables, 13 refs. (Rept. no. D1-82-0171)
Unclassified report

Also available from the author.

DESCRIPTORS: *Brillouin zones, *Crystal structure, *Ions, Lithium, Sodium, Potassium.

The tight-binding method for the calculation of one-electron states in solids is applied to the s-states of the outermost ion-core electrons of lithium, sodium, and potassium. Wave functions and electronic crystal potential are obtained from orthogonalized Slater orbitals. The 1s ion-core energy of solid lithium with equilibrium lattice parameter is found to be different from the value in the free atom by 0.100 Ry. The corresponding differences for the 2s state of sodium and the 3s state of potassium are 0.026 Ry and 0.0001 Ry, respectively. Reduction of the lattice constant leads to a significant shift of the 1s ion-core level in lithium, not, however, of the 2s state in sodium and the 3s state in potassium. These results appear to be consistent with some known observations of the soft x-ray emission of these metals. (Author)

AD-281 718 Div. 25
(TISTM/EJH) OTS price $12.50

Clevite Corp., Cleveland, Ohio.
RESEARCH ON II-VI COMPOUND SEMICONDUCTORS.
Final technical rept., 1 Jan 60-31 Dec 61 on Research in Solid State Physics,
by L. R. Shiozawa, J. L. Barrett and others.
June 62, 162p. incl. illus. tables, 42 refs.
(Contract AF 33(616)6865, Proj. 7021)
(ARL 62-365) Unclassified report

DESCRIPTORS: *Semiconductors, *Single crystals, *Cadmium compounds, *Zinc compounds, Electrical properties, Hall effect, Electrical conductance, Dielectric properties, Physical properties, Refractive index, Crystals, Lattices, Preparation, Zone melting, Purification, Sulfides, Selenides, Tellurides, Solid state physics, Materials, Growth.

Preparation, purification, crystal growth, and measurement of the fundamental bulk properties of CdS, CdSe, ZnTe, and CdS-CdSe mixed crystals are summarized. Large single crystals of CdS, CdSe, and ZnTe were prepared by the Reynolds-Greene sublimation method. CdSe crystals were also prepared by gradient freezing. Methods for preparing test specimens for electrical and optical measurements are presented. Procedures for conducting high-temperature equilibrium studies on CdSe are discussed. Extensive Hall-effect and conductivity measurements between 77 and 500 K were made on miscellaneous crystals. Other measurements included melting points, refractive indexes, elastic, dielectric, piezoelectric and lattice constants. Correlations were obtained between the sign of the polar axis in CdSe and ZnTe and the X-ray determined AB layer order. (Author)

AD-281 723 Div. 25
(TISTP/FR) OTS price $4.60

Institute for Advanced Studies, Dublin (Eire).
TABLES AND GRAPHS FOR USE IN AEROSOL PHYSICS. PART II. NUMBER OF UNCHARGED PARTICLES IN PER CENT OF TOTAL NUMBER OF PARTICLES v. RADIUS AND VICE VERSA,
by A. L. Metnieks and L. W. Pollak. Dec 61, 35p. incl. illus. tables, 4 refs. (Technical (Scientific) note no. 15; Geophysical bull. no. 20)
(Contract AF 61(052)26)
(AFCRL 62-616) Unclassified report

DESCRIPTORS: *Aerosols, Particles, Temperature, Tables.

For temperatures of 0 15, 20 and 25 C, the number F of uncharged particles in percent of the total number of particles for the radii r = 0.5 times 10 to the -6th power to 109 times 10 to the -6th power cm in steps of .01 times 10 to the -6th power, 0.1 times 10 to the -6th power and 1.0 times 10 to the -6th power respectively and the radii as a function of F for each tenth of a percent. (Author)

AD-281 736 Div. 25, 8
(TISTM/EJH) OTS price $4.60

General Telephone and Electronics Labs., Inc., Bayside, N. Y.
HOT CARRIER PHENOMENA IN SEMICONDUCTORS AT MICROWAVE FREQUENCIES.
Quarterly rept. no. 4, 15 Feb-15 May 62,
by Esther Conwell, Vernon J. Fowler and Joseph Zucker. 30 June 62, 35p. incl. illus. table, 8 refs. (Rept. no. TR 62-7.4)
(Contract DA 36-039-sc-87298)
Unclassified report

DESCRIPTORS: *Semiconductors, *Germanium, *Microwave equipment, Electron capture, Impurities, Copper, Nickel, Indium compounds, Antimonides, Ions, Conductivity, Diffusion, Electrons, Electrical properties, Dielectric properties, Recombination reactions, Microwave frequency, Electric fields, Temperature, Solid state physics.

Measurements of recombination in Cu- and Ni-doped Ge, using contact injection, were made and corrected for surface recombination. The data for Ge:Ni at room and dry ice temps. are similar; for Ge:Cu they are different in that lifetime first increases with field, then decreases at the low temp. Throughout this temp. range, the following appear to be established; (1) the electron capture cross section for neutral Ni and neutral Cu decreases rapidly with electron speed; and (2) for Cu(-) it is essentially independent of speed. The difference in speed-dependence of neutral and negatively-charged centers seems attributable to the Coulomb barrier of the latter. Complex conductivities of n-Ge are reported for 3 samples in different orientations and comparable dc resistivites at 78k. For n-InSb at 78k, large negative values of dielectric constant were found. (Author)

AD-281 753 Div. 25, 9
(TISTP/WH) OTS price $3.60

Marburg U. (Germany).
CALCULATIONS OF COLLISION INTEGRALS IN THE MOMENT EQUATIONS,
by Kurt Suchy. 1961, 37p. incl. illus. 14 refs.
(Contracts DA 91-591-EUC-1504 and DA 91-591-EUC-1872)
Unclassified report

DESCRIPTORS: *Kinetic theory, *Thermodynamics, *Gases, *Superaerodynamics, Integrals, Vector analysis, Functions, Tensor analysis.

For the calculation of the collision integrals in the moment equations Weitzsch's ansatz is made for the velocity distribution functions being represented as integral superposition of Gaussian distributions. Its weighting function must contain a finite number of velocity independent parameters for the treatment of problems with strong deviations from equilibrium. For weak deviations a series expansion yields Grad's expansion of the distribution function in tensorial Hermite polynomials. The moment equations with their collision integrals are established up to the third order and the transport cross sections occurring therein are calculated for inverse power interaction potentials. (Author)

AD-281 755 Div. 25, 15
(TISTM/TCG) OTS price $8.60

Massachusetts Inst. of Tech., Cambridge.
VIBRATIONS IN HETEROGENEOUS ELASTIC PLATES,
by Peng-Chih Yang and Charles H. Norris. June 62, 88p. incl. illus. 22 refs. (Rept. no. R62-24)
(Contract Nonr-184177, Proj. NR 064-466)
Unclassified report

DESCRIPTORS: *Vibration, *Sheets, *Elasticity, *Dynamics, Vibration mechanisms, Differential equations, Shear stresses, Deformation, Thickness, Laminates, Metal plates, Mathematical analysis, Theory.

A two-dimensional heterogeneous dynamic plate theory was deduced from the three-dimensional dynamic equations of elasticity. The heterogeneity of the material was considered to be only along the thickness coordinate of the plate. Approximations of shear deformations and of rotatory inertia were included. A tenth order differential equation was derived. Five boundary conditions and proper initial conditions were obtained to insure an unique solution. It was recognized that the fact of coupling between stretching and bending in the heterogeneous plate led to this higher order (tenth) differential equation. The heterogeneous plate theory was specialized to cases of symmetrically laminated aeolotropic, orthotropic and isotropic plates respectively. A heterogeneous plate theory neglecting shear deformations was also deduced from the three-dimensional dynamic equation of elasticity. It was shown that the method of solving the forced vibration of a homogeneous plate of finite length could be extended to a heterogeneous plate. (Author)

AD-281 758 Div. 25
(TISTP/JW) OTS price $9.10

Nuclear Defense Lab., Army Chemical Center, Md.
AN INITIAL GAMMA-RAY SPECTROGRAPH,
Rept. for Jan 59-Apr 61,
by W. R. Van Antwerp. Feb 62, 104p. incl. illus. tables, 23 refs. (Rept. no. NDL-TR-20)
Unclassified report

DESCRIPTORS: *Gamma ray spectra, *Compton effect, Instrumentation, Magnetic properties, Pulse analyzers, Electrons, Beta ray spectroscopy, Gamma ray spectroscopy.

The feasibility of an initial gamma-ray spectrograph has been investigated. An instrument based on the magnetic analysis of Compton electrons is presented as having suitable attributes for use in the laboratory or in the field and for the measurement of gamma spectra from weapons or pulsed reactors. The instrument is designed for an energy range from 1 to 12 Mev and may be useable over the range from 0.25 to 25 Mev. Use of the natural focal properties of uncollimated Compton electrons in a semicircular beta-ray spectrograph is proposed, and theoretical and experimental results are presented on the performance of such an instrument. The resolution that can be obtained is approximately 40 kev, the instrument can be used at arbitrarily high rates, and the sensitivity is very low. In a typical situation 10 to the 15th power gamma rays might be just detectable. (Author)

AD-281 776 Div. 25, 4
(TISTM/EJH) OTS price $2.60

Sheffield U. (Gt. Brit.).
THE TRIPLET STATE.
Final technical rept.,
by George Porter. 30 Mar 62, 20p. tables, 13 refs.
(Contract AF 61(052)32)
(AFCRL 62-626) Unclassified report

DESCRIPTORS: *Photolysis, *Nuclear states, *Anthracenes, *Naphthalenes, *Phenanthrenes, Atomic energy levels, Electron transitions, Halides, Organic solvents, Cyclohexanes, Molecular structure, Chlorides, Bromides, Photoemission, Phosphorescence, Radioactive decay, Ultraviolet spectroscopy, Spectrographic analysis, Decomposition.

The first order decay of triplet states of naphthalene, anthracene, phenanthrene and their halogenated derivatives was studied in cyclohexane and viscous paraffin solutions. The decay results partly from a bimolecular quenching process and partly from a true first order radiationless conversion to the ground state. The rate of the quenching process is a function of the solvent and, in anthracene derivatives, of the extent to which the solutions have been irradiated. The rates of radiationless conversion can only be measured when they exceed the rates of quenching processes. Bromination of anthracene is 10 times more effective in enhancing conversion than chlorination at the same position and halogenation at the 9, 10 positions has four times the effect of halogenation at other positions. (Author)

AD-281 779 Div. 25
(TISTM/EJH) OTS price $1.60

Virginia U., Charlottesville.
HEXAGONAL NETWORKS OF LINEAR IMPERFECTIONS IN SINGLE CRYSTALS OF CADMIUM,
by J. C. Crump, III and J. W. Mitchell.
31 July 62, 9p. illus. 3 refs.
(Contract Nonr-47405)
Unclassified report

DESCRIPTORS: *Single crystals, *Cadmium, *Crystal structure, Ion bombardment, Electron bombardment, Electron diffraction analysis, Solid state physics, Lattices, Radiation effects.

The formation and properties of a type of hexagonal network in thin crystals of cadmium are described. The networks appear almost immediately after the disappearance of vacancy-type loops introduced by bombarding the crystals with negative ions in the electron microscope. They lie in basal planes and the directions of the three sets of intersecting lines are parallel to the (1100) directions in these planes. Mobile specks which are attributed to clusters of interstitial atoms have also been observed. (Author)

# Division 25 - PHYSICS

AD-281 847 Div. 25
(TIPSP/WH) OTS price $12.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
ON THE POSSIBLE AND IMPOSSIBLE IN OPTICS (O Vozmozhnom I Nevozmozhnom V Optike),
by G. G. Slyusarev. 16 July 62, 163p. incl. illus. table (Trans. no. FTD-TT-62-175 from Gosudarstvennoye Izdatel'stvo Fiziko-Matematicheskoy Literatury Moksva 1-190, 1960)
Unclassified report

DESCRIPTORS: *Optics, *Optical systems, *Light, Electron beams, X rays, Amplitude modulation, Wave characteristics, USSR, Limiters, Physical properties.

Contents:
Combustion from afar
Optical myths
Reversibility and irreversibility in optics
Resolution limit of optical systems (Microscopes and telescopes)
Phase, amplitude and image

AD-281 876 Div. 25, 30
(TISTM/EJH) OTS price $5.60

Brown U., Providence, R. I.
AN EXPERIMENTAL METHOD FOR MEASURING THE ELECTRICAL CONDUCTIVITY OF HIGH TEMPERATURE GASES.
Doctoral thesis,
by Gordon F. Anderson. June 62, 39p. incl. illus. table, 12 refs. (Technical rept. no. WT-35)
(Grant AF-AFOSR-62-111) Unclassified report

DESCRIPTORS: *Plasma physics, *Gas ionization, *Electrical conductance, *Gases, *Air, Electrical properties, Theory, Impedance, High temperature research, Test equipment, Shock tubes, Coils.

The feasibility of utilizing the effect of a conducting medium on the impedance of a small coil for the measurement of the conductivity of high temperature gases is first investigated theoretically and then developed experimentally. The method described is well suited for measuring the electrical conductivity of gases at high densities. Data which have been obtained for air in the range of 5 mhos/meter to 250 mhos/meter at atmospheric density are included to illustrate the use and feasibility of the experimental technique. (Author)

AD-281 887 Div. 25
(TISTM/EJH) OTS price $2.25

Defense Metals Information Center, Columbus, Ohio.
CHEMICAL VAPOR DEPOSITION.
4 June 62, 82p. incl. illus. tables (DMIC rept. no. 170)
(Contract AF 33(616)7747, Proj. 2(8-8975))
Unclassified report

DESCRIPTORS: *Crystals, *Single crystals, *Metallic smoke deposits, *Thin films, *Vapor plating, Metallic crystals, Metalorganic compounds, Oxides, Carbides, Refractory coatings, Coatings, Metallic smoke deposits, Vapors, Gases, Kinetic theory, Diffusion, Growth.

The promise and problems of chemical vapor deposition
High-purity metal production; Coating of particles; Molecular electronics; Refractory metal coatings; Corrosion-resistant coating; Pyrolytic C; and Refractory carbon.
Growth of crystalline films and layers by chemical vapor deposition
Bulk deposits; Thin-films and epitaxial growth
Whisker growth
Metal-organic decomposition
Mechanisms for metal alkyl decomposition; Stable organic molecule; Decomposition of tetraphenylsilane; Decomposition of tetracyclohexylsilane
Chemical vapor deposition of diffusion coatings
Vapor-phase-transfer processes during vapor deposition
Surface deposition - gas kinetics controlling;
Surface deposition - gas diffusion controlling;
Problems requiring additional research

AD-281 902 Div. 25
(TISTM/EJH) OTS price $7.60

General Electric Co., Schenectady, N. Y.
RESEARCH ON CdTe.
Summary progress rept., 1 May 61-30 Apr 62,
by R. E. Halsted, M. R. Lorenz, and D. T. F. Marple. 30 Apr 62, 79p. incl. illus. tables, refs.
(Contract AF 33(616)8264)
Unclassified report

DESCRIPTORS: *Semiconductors, *Intermetallic compounds, *Cadmium compounds, *Tellurides, *Single crystals, Solid state physics, Solids, Vapors, Fluorescence, Photoemission, Phase studies, Dielectric properties, Impurities, Thermodynamics, Growth.

Contents:
Dielectric constant behavior near band edges in CdTe and Ge
Band edge emission properties of CdTe
Phase equilibria in the system Cd-Te
Preparation of CdTe crystals from near stoichiometric and Cd rich melt compositions under constant Cd pressure
The solid-vapor equilibrium of CdTe

AD-281 922 Div. 25
(TISTP/WH) OTS price $16.00

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
SPACE, TIME, RELATIVITY, AND COSMOLOGY,
by W. F. G. Swann. Mar 62, 241p. incl. illus. tables, 117 refs. (Rept. no. F-B1859)
(Contract AF 30(602)2521)
(RADC TR 62-2)
Unclassified report

DESCRIPTORS: *Relativity theory.

Contents:
Development of the concepts of space and time
Time and space in the light of the restricted theory of relativity
Time and space in relation to the general theory of relativity

AD-281 927 Div. 25
(TISTM/MS) OTS price $6.60

Honeywell Research Center, Hopkins, Minn.
THE OPTICAL AND ELECTRICAL PROPERTIES OF SINGLE CRYSTAL TELLURIUM.
Final rept.
31 May 62, 63p. incl. illus. tables, 41 refs.
(Contract AF 49(638)908)
(AFOSR-2648)
Unclassified report

DESCRIPTORS: *Single crystals, *Tellurium, Electrical properties, Mechanical properties, Optics, Resistance, Crystal structure, Magnetic properties, Impurities, Lattices, Temperature, Growth, Purification, Deformation, Production, Semiconductors.

Work on zone purification and growth of doped and undoped single crystals is noted. Mechanical properties, plastic damage, and identification of dislocations by etch pits are briefly covered. A section on optical properties notes our discovery of optical activity in tellurium, and details the work on intrinsic optical absorption, showing how this implies a ''vertical'' transition at the absorption edge, which is allowed for E perpendicular to C and forbidden for E parallel to C. The report goes on to recapitulate the progress made in understanding recombination processes in tellurium (both flaw processes and band-to-band processes). A section on transport effects outlines the extensive studies made of magnetoresistance, and the recent measurements of hole mobility at low temperatures in doped and undoped crystals. Finally, some of the expectations concerning the energy band structure of tellurium are reviewed. (Author)

AD-281 935 Div. 25
(TISTM/EJH) OTS price $1.00

Martin-Marietta Corp., Baltimore, Md.
THE EFFECT OF SURFACE-ACTIVE AGENTS ON THE MECHANICAL PROPERTIES OF METALS. PART I. THE EFFECT OF SURFACE-REMOVAL ON THE PLASTIC BEHAVIOR OF ALUMINUM SINGLE CRYSTALS.
Rept. for Jan 60-Jan 61 on Research on New Chemical Systems and Methods of Synthesis,
by I. R. Kramer. Apr 61, 29p. incl. illus. 32 refs.
(Contract AF 33(616)6220, Proj. 7023)
(WADD TR 61-58, pt. 1) Unclassified report

DESCRIPTORS: *Single crystals, *Aluminum, Surfaces, Surface properties, Plastic flow, Stresses, Shear stresses, Plasticity, Deformation, Lattices, Cleaning.

Aluminum single crystals were pulled in an electrolytic cell and the surface of the crystal was removed during the deformation. The extent of Stages I and II (of the deformation processes) was increased and their slopes decreased as the rate of metal removed from the surface was increased. Increasing the strain rate caused a decrease in the extent of Stages I and II and increased the slopes. The experimental data indicate that the work-hardening coefficient of Stage I is determined primarily by the conditions which exist on the surface of the crystal. In Stages II and III, both surface effects and internal barriers are important. (Author)

AD-281 938 Div. 25
(TISTP/JW) OTS price $1.60

Nuclear Defense Lab., Army Chemical Center, Md.
EXPERIMENTAL DETERMINATION OF THE REACTION CROSS SECTIONS FOR Mg24(n,p)Na24 AND Al27(n,a) Na24 AT SEVERAL DIFFERENT NEUTRON ENERGIES,
by John H. McNeilly, John W. Kinch and others.
29 Apr 62, 12p. incl. illus. table, 3 refs.
(Rept. no. NDL-TR-29)
Unclassified report

DESCRIPTORS: *Neutron spectrum, *Reaction kinetics, Magnesium compounds, Sodium compounds, Argon, Reliability, Isotopes.

The results of the investigations described add several experimental values for the cross section of the Mg-24(n,p)Na-24 and the Al-27(n,alpha)Na-24 reactions to those that are presently available in the literature. The results are presented with an estimated reliability of ±6%.

AD-282 017 Div. 25
(TISTM/GEC) OTS price $.75

Martin-Marietta Corp., Baltimore, Md.
THE EFFECT OF SURFACE-ACTIVE AGENTS ON THE MECHANICAL PROPERTIES OF METALS. PART II. THE EFFECT OF SURFACE-ACTIVE AGENTS ON THE MECHANICAL BEHAVIOR OF ALUMINUM SINGLE CRYSTALS.
Rept. for Jan 60-Jan 61, on Research on New Chemical Systems and Methods of Synthesis,
by I. R. Kramer. Apr 61, 20p. incl. illus. tables, 22 refs.
(Contract AF 33(616)6220, Proj. 7023)
(WADD TR 61-58, pt. 2) Unclassified report

DESCRIPTORS: *Metallic crystals, *Single crystals, Surface properties, Shear stresses, Wetting agents, Stearic acids, Metallic soaps, Adsorption, Mechanical properties, Chemical milling, Aluminum.

Single crystals of Al were pulled in tension in a solution of paraffin oil and stearic acid. The critical resolved shear stress did not change with the concentration of the stearic acid solution; however, the extent and slopes of Stages I and II were affected greatly. The observations lend evidence that the weakening effect of surface-active agents is controlled by the rate of desorption of the metal soap formed by the reaction of the surface-active agent and the metal surface. (Author)

AD-282 043 Div. 25, 15
(TISTP/JW) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE ESTIMATION OF A SYSTEM PULSE TRANSFER FUNCTION IN THE PRESENCE OF NOISE,
by Morris J. Levin. 9 July 62, 14p. incl. illus. 17 refs. (Rept. no. 34G-8)
(Contract AF 19(628)500)
(AFESD TDR 62-101)
Unclassified report

DESCRIPTORS: *Pulse communication systems, *Linear systems, *Noise analyzers, Least squares method, Matrix algebra, Statistical processes, Measurement, Errors.

Efficient determination of system parameters from records of input-output data is important in many applications such as adaptive systems, process control, and communication over time-varying channels. Statistical estimation theory is applied to derive effective techniques for measurement of the pulse transfer function of a linear system from normal operating records obscured by additive noise. It is shown that the problem is equivalent to that of fitting a hyperplane to a set of observed points with random errors in certain coordinates. The methods of T. Koopmans are applied to obtain generalized least-squares estimates which are also maximum likelihood estimates when the noise is white and Gaussian. The estimates of the coefficients are obtained as the components of the eigenvector corresponding to the smallest eigenvalue of the matrix equation $[\underline{A} - \theta_1 \underline{Z}]\underline{Y} = 0$. Here $\underline{A}$ is a matrix of sample auto- and cross-correlation

functions of the input and output records and $\underline{Z}$ is the covariance matrix of the corresponding noise components. Expressions for the sampling variances and bias are given. The properties of the simpler standard least squares estimates are also considered. The appropriate modifications for non-white noise are described. (Author)

AD-282 086 Div. 25, 4
(TISTP/WH) OTS price $4.60

Lyons U. (France).
ATOMS AND FREE RADICALS SPECTROSCOPY.
Final rept.,
by M. Peyron. 5 Apr 62, 42p. incl. illus. tables, 16 refs.
(Contract AF 61(052)497)
(AFCRL 62-655) Unclassified report

DESCRIPTORS: *Free radicals, *Spectrographic analysis, *Atoms, *Chemical reactions, *Infrared radiation, Ozone, Nitrogen, Hydrogen, Hydrochloric acid.

The gas phase reaction zone of a few selected atomic reactions has been spectroscopically studied. Evidence of a reaction between ozone and atomic nitrogen has been obtained. The reaction between hydrogen atoms and phosphorus made possible the observations and study of a new emission spectrum, probably due to a polyatomic free radical. Vibrationally excited HCl has been detected by its infrared emission spectrum in the atomic hydrogen and chlorine reaction. A few preliminary observations have been made on the products from some of the above reactions condensed at liquid helium temperature. (Author)

AD-282 102 Div. 25
(TISTM/EJH) OTS price $3.60

Institute of Tech., U. of Minn., Minneapolis.
DEFECT COMPLEXES AND LITHIUM PRECIPITATION IN GERMANIUM,
by R. D. Weltzin and R. A. Swalin. 20 July 62, 24p. incl. illus. table, 13 refs. (Technical rept. no. 4)
(Contract Nonr-71027)
Unclassified report

DESCRIPTORS: *Semiconductors, *Germanium, *Lithium, Crystals, Single crystals, Impurities, Nucleation, Oxygen, Heat treatment, Radiation effects, Gamma rays, Solid state physics.

The role of O, gamma-ray bombardment, annealing temperature and solute concentration in the nucleation of Li precipitates in Ge was investigated. Analysis of the experimental data indicates that the primary nucleation site for Li precipitation is an O-vacancy defect pair. (In actuality since O is normally interstitially dissolved, this defect is equivalent to a substitutional O.) The evidence indicates that about 1% of the O exists in this substitutional state. For the reaction O + V = O-V it is determined that the binding enthalpy of the pair is -0.6 eV. Li also exists in the paired state with interstitial O although these complexes apparently are not active as nucleating sites. At room temperature about 25% of the interstitial O atoms are paired according to the reaction Li(+) + O = Li(+)O. The heat of binding of the pair is calculated to be about -0.5 eV. The possible explanation as to why substitution O and not interstitial O is important in nucleation of Li is presented. (Author)

AD-282 103 Div. 25
(TISTM/WH) OTS price $1.60

Notre Dame U., Ind.
EFFECT OF LIGHT ON MECHANICAL PROPERTIES OF SEMICONDUCTORS.
Final rept., Sep 58-Aug 60,
by George C. Kuczynski. May 62, 14p. incl. illus. table, 7 refs.
(Contract Nonr-162307)
Unclassified report

DESCRIPTORS: *Semiconductors, *Intermetallic compounds, Photosensitivity, Plasticity, Germanium, Silicon, Light, Antimonides, Selenides, Arsenides, Indium compounds, Photochemistry, Mechanical properties.

A resume of knowledge concerning the photomechanical effect to mid-1961 is presented. Efforts were exerted towards identification of the effects in other semiconductors. It was found that it occurs in InSb, InSe and InAs. In addition, an effort was made to detect any plastic deformation during bending of Ge and Si plates under illumination. A series of experiments were designed to detect any effect of oxidation upon fracture stress and hardness of Si crystals; none was observed. However, the fracture characteristics were very sensitive to fracture stress. Up to about 200 Kg/sq-mm, the Si plates fractured into several large crystal chunks; above this stress they were pulverized during fracture. Illumination with UV X-ray radiation had no effect upon this phenomenon. (Author)

AD-282 104 Div. 25, 17
(TISTM/WH) OTS price $1.60

Naval Research Lab., Washington, D. C.
EFFECT OF CHAMFERED HOLES ON THE RESISTANCE OF BOLTS AND DOWELS TO SHOCK LOADS IN SHEAR,
by I. Vigness, E. R. Seibert and H. M. Forkois. 9 July 62, 13p. incl. illus. table, 2 refs.
(NRL rept. no. 5797)
Unclassified report

DESCRIPTORS: *Bolts, *Impact shock, *Shear stresses, *Tensile properties, *Load distribution, *Geometry, *Stresses, Deformation.

Under dynamic loading conditions associated with shock motions, hold-down bolts may be subjected to both shear and tensile stresses. If the bolt holes in the shear plane are chamfered so as to permit the bolt to deform in shear and bending along its length, the amount of energy absorbed by the bolt before fracture is increased when shear motions are encountered. The amount of energy absorbed when a 45-degree chamfer was employed was a constant (the energy absorbed by a bolt in shear with no chamfer) plus a term directly proportional to the length of the chamfer. The maximum load developed is about the same for all chamfer sizes in a given material, but this load will be maintained for a greater number of shocks for the larger chamfer sizes. The chamfer caused some decrease in stiffness of the joint for shear motions. For relatively large chamfer sizes, or for relatively non-ductile materials, bolt failure resulting from shear motions may be prematurely caused by tensile stresses. (Author)

AD-282 132 Div. 25
(TISTP/WH) OTS price $3.60

Case Inst. of Tech., Cleveland, Ohio.
PRESSURE DERIVATIVES OF THE ELASTIC CONSTANTS OF CADMIUM.

Technical rept. no. 6 on Solid State Physics Program,
by J. A. Corll. June 62, 33p. incl. illus. tables, 20 refs.
(Contract Nonr-114105, Proj. NR 017-309)
Unclassified report

DESCRIPTORS: *Cadmium, *Pressure, *Elasticity, *Solid state physics, *Single crystals, *Ultrasonics.

The pressure derivatives of the elastic stiffness constants of cadmium have been measured by the ultrasonic pulse echo technique. In terms of dC/dP the results are: C11, 9.29; C33, 7.26; C66, 2.59; C44, 2.38; C12, 4.10; C13, 5.66; and C11 + C12 + 2C33 - 4C13, 5.27. These values are comparable with those previously found for polyvalent aluminum and magnesium. An attempt was made to fit to cadmium the theory of Reitz and Smith (Phys. Rev. 104:1253, 1956) for the elastic constants of magnesium. A fit could not be made, presumably because of the high overlap electron populations which arise from the anomalously high (c/a) ratio of cadmium. Consequently the pressure data could not be interpreted in terms of this model as was the same data for magnesium. (Author)

AD-282 134 Div. 25, 10, 14
(TISTM/GEC) OTS price $6.60

Columbia U., New York.
ANELASTIC-PLASTIC BEHAVIOR OF A FILLED ELASTOMER,
by Robert A. Heller, Robert D. Stoll, and A. M. Freudenthal. June 62, 57p. incl. illus. tables, 19 refs. (Technical rept. no. 13)
(Contract Nonr-26678)
Unclassified report

DESCRIPTORS: *Urethanes, *Synthetic rubber, *Elastomers, *Mechanics, Composite materials, Reinforcing materials, Potassium compounds, Chlorides, Pressure, Hydrostatic pressure, Elasticity, Stresses, Deformation, Recovery, Mathematical analysis, Viscosity, Photoelasticity, Test methods, Solid rocket propellants.

The rheological behavior of an elastomer composed of a polyurethane rubber filled with granular KCl is analyzed in compression with superimposed hydrostatic pressure as well as under conditions of relaxation of unconfined compression. It is suggested that this behavior may be approximated by a volume-constant linear anelastic response for relatively small strains until a marked change in structure occurs after which further deformation involves dilatation dependent on mean pressure. After large deformation, rapid recovery of shape to very near initial configuration is found to occur upon unloading. Theories are proposed which describe the observed behavior. (Author)

AD-282 135 Div. 25
(TISTP/JW) OTS price $11.50

Firestone Flight Sciences Lab., Calif. Inst. of Tech., Pasadena.
HYPERSONIC WAKES.
Rept. on Hypersonic Research Project,
by John F. McCarthy, Jr. 2 July 62, 139p. incl. illus. tables, 48 refs. (Memo. no. 67)
(Contract DA 04-495-ORD-3231)
Unclassified report

DESCRIPTORS: *Hypersonic flow, Mach number, Reynolds number, Wind tunnels, Turbulent flow, Laminar boundary layer, Pressure, Temperature, Fluid flow, Wake.

An experimental investigation was made of the flow field behind a two-dimensional circular cylinder at a nominal Mach number of 5.7. The free-stream Reynolds number based on the cylinder diameter was varied over a range from 4300 to 66,500 by changing both the diameter of the cylinder and the stagnation pressure of the wind tunnel. Pitot-pressure, static-pressure, and total-temperature measurements were made at various distances behind the cylindrical rod in order to determine the state properties in the wake. Base-pressure measurements were also taken at various Reynolds numbers. From these measurements, the transition from laminar to turbulent flow in the wake was determined and successfully correlated with other data. A transition Reynolds number based on local conditions and the length of laminar run was determined. Extensive comparison of the experimental data with Kubota's theory for laminar flow was then made. A satisfactory comparison was made between theory and experiment. Because of the nature of the tests conducted, only a qualitative comparison was made with the theory of Lees and Hromas for turbulent flow. (Author)

AD-282 145 Div. 25
(TISTP/WH) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DIVISION 8. SOLID STATE.
Quarterly progress rept., 1 Apr-30 June 62.
15 July 62, 4p.
(Contract AF 19(628)500)
(AFESD TDR 62-110) Unclassified report

DESCRIPTORS: *Solid state physics, *Transistors, *Brillouin zones, *Electrochemistry, Light communication systems, Infrared communication systems, Quantum mechanics.

Contents:
Solid state device design
Chemistry
Materials research
Band structure of solids
Microwave and magnetic properties of solids

AD-282 148 Div. 25
(TISTP/WH) OTS price $8.10

Microwave Lab., Stanford U., Calif.
BLACK-BODY DISTRIBUTION LAW IN SEMICLASSICAL RADIATION THEORY.
Technical rept.,
by J. H. Eberly. July 62, 81p. incl. illus.
(M. L. rept. no. 940)
(Contract Nonr-225(48), Proj. NR 373-361)
Unclassified report

DESCRIPTORS: *Blackbody radiation, *Electromagnetic fields, *Atoms.

A formalism is developed, employing an improved semi-classical theory of electrodynamics, with which it is possible to treat interacting systems of radiation and large or small numbers of atoms. The theory differs from the ordinary semiclassical theory as it is most commonly employed in two ways: (1) The neoclassical theory takes consistent account of the effect of the atoms on the electromagnetic fields, as well as the effect of the fields on the atoms. (2) The neoclassical theory avoids the use of perturbation theory in the usual sense, and does not introduce the concept of transition probability. The neoclassical theory is based on the attempt to integrate Schrodinger's equation directly. (Author)

AD-282 154 Div. 25, 4
(TISTM/MS) OTS price $2.60

Naval Research Lab., Washington, D. C.
THERMOELECTRIC INSTABILITY OF SOME NOBLE METAL THERMOCOUPLES AT HIGH TEMPERATURES,
by B. E. Walker, C. T. Ewing, and R. R. Miller. 29 June 62, 19p. incl. illus. tables, 10 refs. (NRL rept. no. 5792)
Unclassified report

DESCRIPTORS: *Thermocouples, Thermoelectricity, High temperature research, Heat resistant wire, Metals, Iridium, Platinum, Rhodium, Oxidation, Oxides, Aluminum compounds, Impurities, Iron, Stability.

Thermoelectric instabilities of noble metal thermocouples and individual thermoelements were studied from 1000 to 1700 C under oxidizing and neutral atmospheres. The principal source of instability was a contamination of the thermoelements by impurities from ceramic protection tubes. Several grades of alumina sheathing were tested, and thermocouple errors associated with each grade were determined. With alumina sheathing the principal contaminant was iron, and the instability generated was at least an order of magnitude greater in a neutral atmosphere than in an oxidizing atmosphere. Increasing the wire size increases stability in a neutral atmosphere, although not in an oxidizing atmosphere. Instability increases rapidly with temperature between 1000 and 1700 C, but the order of decreasing stability remains Pt-6%Rh/Pt-30%Rh, Pt-1%Rh/Pt-13%Rh, and Pt/Pt-10%Rh or Pt/Pt-13%Rh. The instability of pure rhodium thermoelements, and of Ir and Ir-50%Rh thermoelements, depends on internal changes, and not as much on iron contamination as the Pt-Rh series of thermoelements; hence the pure rhodium and the iridium thermoelements become preferable if gross iron contamination is expected. (Author)

AD-282 156 Div. 25
(TISTP/WH) OTS price $10.10

New Mexico U. Engineering Experiment Station, Albuquerque.
ELECTROMAGNETIC RADIATION IN MAGNETO-IONIC MEDIA FOR VLF AND VHF SPECTRA,
by Kenneth R. Cook. July 62, 125p. incl. illus. 13 refs. (Technical rept. no. EE-76)
(Contract Nonr-279801)
Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Plasma physics, *Very low frequency, *Very high frequency, *Electric fields, Magnetic fields, Ions.

Contents:
Fundamental relations pertaining to electromagnetic phenomena in homogeneous plasmas
Development of a set of potential functions for current sources in a magneto-ionic medium
Radiation from an electric dipole in a magneto-ionic medium
Radiation from a magnetic dipole in a magneto-ionic medium

AD-282 159 Div. 25
(TISTP/TL) OTS price $2.60

Ohio State U. Research Foundation, Columbus.
NUCLEATION IN CONDENSATION FROM THE VAPOR ONTO A SUBSTRATE,
by J. P. Hirth. July 62, 21p. 39 refs. (Technical rept. no. 1)
(Contract Nonr-49526)
Unclassified report

DESCRIPTORS: *Nucleation, *Condensation, *Water vapor, *Crystals, *Probability, *Quantum statistics, *Surfaces, *Molecular beams, Thermodynamics, Entropy, Gases, Pressure, Sensitivity, Surface properties, Diffusion, Relaxation time, Vibration, Functions, Molecules.

A recent theory of Lothe and Pound indicates that appreciable entropies of formation of embryos markedly affect homogeneous nucleation from the vapor phase. Similar constraints are considered here for nucleation on substrates, using a statistical development of a nucleation rate expression. It is shown that nucleation may be very dependent on surface contributions to the entropy of formation of a nucleus. (Author)

AD-282 160 Div. 25
(TISTM/WH) OTS price $1.60

Polytechnic Inst. of Brooklyn, N. Y.
A STRESS-STRAIN RELATION FOR INELASTIC MATERIAL BEHAVIOR,
by Sharad A. Patel, B. Venkatraman, and James Bentson. July 62, 16p. incl. illus. 7 refs. (PIBAL rept. no. 655)
(Contract Nonr-83923, Proj. NR 064-433)
Unclassified report

DESCRIPTORS: *Cylindrical bodies, *Spheres, Deformation, Mechanics, Plasticity, Stresses.

A stress-strain relation for inelastic material behavior is formulated. The formulation is based upon the Ramberg-Osgood uniaxial law, Prager's general strain-hardening relation, and Hencky's hypothesis. With the use of this relation, the problems of a thick hollow sphere and a thick circular cylinder, each subjected to uniform internal and external pressures, are analyzed. The stress solutions are obtained in close parametric form. The results are illustrated by the solution of particular examples. (Author)

AD-282 172 Div. 25, 8
(TISTP/JW) OTS price $2.60

Defense Research Lab., U. of Texas, Austin.
(No title).
Progress rept. no. 3, 1 Apr-30 June 62, 15 July 62, 14p. incl. illus.
(Contract NObs-86165)
Unclassified report

DESCRIPTORS: *Acoustic filters, *Acoustic impedance, *Liquids, Wave transmission, Sound, Pressure, Measurement, Hydrophones, Hoses, Pipes, Vibration, Vibration isolators.

Recalibration of the mechanical impedance head is described. A sensitivity of 56.1 db re 1 gram for the instrument with 75 ft of cable was found. Measurements of mechanical mobility parameters of a special pressure ballanced pipe coupling are described. Parameter values obtained for coupling internal pressures of 0 to 75 psig were substantially in agreement. Input mechanical mobility of a flanged metal pipe and weight structure to axial forces has been calculated and measured. Results of the measurements were in close agreement with calculated values, although vibration of the pipe produced large differences at particular frequencies. Longitudinal wave propagation velocity in copper-nickel pipe has been found from measured values of the input mechanical mobility of a 12 ft length of the pipe. A value of 13,382 ft per second was found. The freefield velocity for longitudinal waves in this material is 13,610 ft

per second. Transmissiblity of the special pipe coupling attached to the assumed pipe-weight load structure has been computed and also measured directly. Differences in transmissibility measured and calculated are attributed to errors in measurement of mobility parameters of the coupling. The measured parameter values were used in the transmissibility calculations. (Author)

AD-282 192 Div. 25, 8
(TISTP/JW) OTS price $3.60

Engineering Development Lab., Naval Air Development Center, Johnsville, Pa.
AN EXPERIMENTAL INVESTIGATION OF SOME ASPECTS OF THE VORTEX COOLING TUBE,
by B. W. Byler. 16 July 62, 32p. incl. illus. tables, 7 refs. (Rept. no. NADC-ED-6224)
Unclassified report

DESCRIPTORS: *Refrigeration systems, *Heating plants, Cooling, Temperature, Fluid flow, Vapor pressure, Boundary layer, Turbulence, Velocity, Pressure.

The objectives were to determine the effect of increased vortex tube diameter on the maximum cold temperature obtainable, and to obtain experimental data on internal flow conditions that might be useful in formulating a theoretical explanation of vortex cooling phenomena. The investigation to determine the effect of increasing diameter on performance indicated no significant change in maximum temperature produced when the diameter of the vortex tube was increased from 1.30 to 2.30 inches. It is felt that improved performance that does occur with diameter increases, results from changes in internal flow conditions other than diameter increases. The investigation to obtain sufficient experimental data that would lead to an explanation of the vortex tube cooling mechanism was not successful. It was established, however, that conditions of constant angular flow exist near the surface of the orifice plate. The vortex tube is not a substitute for either expansion cooling or conventional refrigeration. Its one advantage, that of mechanical simplicity, is countered by extreme noise in addition to low efficiency. (Author)

AD-282 194 Div. 25
(TISTP/JW) OTS price $1.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
A NEW APPROACH TO TRANSPORT PROBLEMS IN FULLY IONIZED PLASMAS II,
by S. F. Edwards and J. J. Sanderson. June 62, 14p. 7 refs. (Technical note BN-293)
(Contract AF 49(638)401)
(AFOSR-3018) Unclassified report

DESCRIPTORS: *Plasma oscillations, *Differential equations, Thermal conductivity, Ionization, Tensor analysis, Viscosity, Transport properties, Green's function.

AD-282 219 Div. 25, 7
(TISTM/MS) OTS price $1.60

RCA Defense Electronic Products, Princeton, N. J.
APPLIED RESEARCH PROGRAM ON HIGH-TEMPERATURE RADIATION-RESISTANT SOLAR-CELL ARRAY.
Quarterly technical progress rept. no. 1, May-July 62.
15 Aug 62, 14p. incl. illus. tables (Rept. no. AED 1558)
(Contract AF 33(657)8490)
Unclassified report

DESCRIPTORS: *Solar cells, Gallium compounds, Arsenides, Heat resistant alloys, High temperature research, Radiation damage, Measurement, Tests, Absorption, Satellite vehicles, Manufacturing methods, Processing.

Effort was made to determine the technology necessary for the application of a high-temperature, radiation-resistant array of solar cells in a configuration suitable to aerospace vehicles. Toward this end, gallium arsenide solar cells are being fabricated for temperature and radiation tests, and experimental studies are being conducted to determine techniques for fabricating modules and arrays. The choice of gallium arsenide solar cells for this program was dictated by the superior high-temperature and radiation-resistance characteristics of gallium arsenide as compared with silicon. These two materials are the only ones which have been extensively developed for solar cell use. The basic properties of silicon and gallium arsenide are shown. It should be noted that gallium arsenide has a larger band gap, higher electron and hole mobility, and a higher atomic mass than silicon. The higher band gap accounts for the better high-temperature performance of gallium arsenide cells. The higher mobilities result in lower internal electrical resistance and the higher mass contributes to a better radiation resistance. Gallium arsenide cells have a potentially higher conversion efficiency, based on theoretical considerations. Because of their earlier development, silicon cells presently have a somewhat higher efficiency. (Author)

AD-282 222 Div. 25, 8
(TISTM/MS) OTS price $2.60

Ronson Metals Corp., Newark, N. J.
MATERIALS FOR AND THE MECHANISM OF GETTERING MULTIPLE COMPONENT GASES.
Scientific rept. no. 3, 8 Mar-8 June 62,
by L. Epstein and L. J. Kaufman. 29 June 62, 18p. incl. illus. refs.
(Contract AF 19(604)8430, Proj. 4619)
(AFCRL 62-526) Unclassified report

DESCRIPTORS: *Electron tubes, *Degasification, *Gas diffusion, Gases, Metals, Surfaces, Chemical reactions, Reaction kinetics, Gas ionization, Pressure, Theory, Mass spectroscopy, Mass spectrometers, Vacuum apparatus, Design, Materials.

Experimental work was directed toward obtaining calibration data relating the partial pressure of a gas to the observed heights of the characteristic peaks as determined by varying the radiofrequency of the electric field produced by the oscillator. Individual gases were examined and a binary mixture of components which do not react with one another was analyzed. Theoretical equations appearing in previous reports were found to contain significant errors; the corrected equations are presented together with an explanation of how these errors tended to make theoretical analysis of experimental data more difficult. A summary of the comparisons between experimental data and predicted values which may be made in order to verify the theoretical assumptions made is given. (Author)

AD-282 253 Div. 25
(TISTP/TL) OTS price $2.60

Aerospace Information Div., Washington, D. C.
SOVIET GAS LASER RESEARCH. REVIEW OF OPEN

LITERATURE.
10 July 62, 19p. incl. illus. 20 refs. (AID rept. no. 62-100)
Unclassified report

DESCRIPTORS: *Lasers, *Masers, *Gases, *Scientific research, *Cesium compounds, *Sodium compounds, *Mercury compounds, *Zinc compounds, *USSR, Glow lamps, Glow discharges, Gas discharges, Vapors, Instrumentation, Photomultipliers, Galvanometers.

An analysis which deals with Soviet gas-laser research is part of a continuing survey of Soviet theoretical and experimental developments in the general maser field. Published Soviet reports on gas-laser development fall readily into a well-defined area and characterize a fairly independent research effort which has little connection with any other aspects of Soviet work in quantum electronics. Soviet scientists engaged in gas-laser work have remained within its boundaries, at least as far as quantum electronics is concerned. (Author)

AD-282 293 Div. 25
(TISTP/JW) OTS price $2.60

Cruft Lab., Harvard U., Cambridge, Mass.
EXCITATION OF SURFACE WAVES ON A PERFECTLY CONDUCTING SCREEN COVERED WITH ANISOTROPIC PLASMA,
by S. R. Seshadri. 7 May 62, 17p. incl. illus. 2 refs. (Technical rept. no. 366)
(Contract Nonr-186632, Proj. NR 371-016)
Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Plasma physics, Magnetic fields, Conductors, Surfaces, Radiation effects, Partial differential equations, Dielectric properties, Excitation.

The field due to a line source of magnetic current situated in a lossless plasma region above a perfectly conducting screen is considered when a uniform static magnetic field is impressed throughout the plasma region parallel to the direction of the line source. It is shown that under certain conditions surface waves are excited on the screen. The dependence of the efficiency of excitation of surface waves on the distance d of the line source from the ground screen is examined. Also, the asymptotic series for the radiation field is derived, and its leading term is shown to vanish for a particular value of d. Under these conditions a strong surface-wave field is maintained near the guiding surface. (Author)

AD-282 303 Div. 25
(TISTP/GRW) OTS price $1.60

Thomas J. Watson Research Center, Yorktown Heights, N. Y.
(No title).
Final rept., 1 June 61-31 May 62, 31 May 62, 15p. incl. illus. 6 refs.
(Contract Nonr-350400)
Unclassified report

DESCRIPTORS: *Superconductivity, Materials, Magnetic fields, Differential equations.

A program of mathematical research was conducted on problems in phenomenological superconductivity theory. The work which was carried out has mainly dealt with the London theory of superconductivity in both its local and nonlocal versions. (Author)

AD-282 308 Div. 25
(TISTP/WH) OTS price $1.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
DISCONTINUITY STRESSES IN SHELLS OF REVOLUTION.
Technical rept. on Mathematics,
by C. R. Steele. 1961, 14p. incl. illus. 3 refs.
(Rept. no. 6-90-62-47)
Unclassified report

DESCRIPTORS: *Elastic shells, *Stresses, *Thermal stresses.

Equations are given for computing the stresses in two thin shells of different geometric, elastic and thermal properties joined by an elastic ring. Relatively simple results are obtained when the ring is inextensional, inflexible, or, at the opposite extreme, negligible. (Author)

AD-282 310 Div. 25, 8
(TISTM/ODN) OTS price $3.60

Little, Arthur D., Inc., Cambridge, Mass.
SUPERCONDUCTIVE EFFECTS IN THIN FILMS.
Interim engineering rept. no. 2, 15 Apr-15 July 62,
by S. Shapiro. 15 Aug 62, 26p. incl. illus. table, 3 refs. (Rept. no. C-64380)
(Contract AF 33(657)7915)
Unclassified report

DESCRIPTORS: *Thin films, *Superconductors, *Electronic equipment, *Metallic crystals, Metal films, Test equipment, Radiofrequency, Crystals, Tests, Detectors, Diodes, Microwave frequency, Resistance, Tin, Oscilloscopes, Aluminum, Feasibility studies, Analysis, Superconductivity.

Despite new testing circuitry, it proved impossible to obtain the desired data showing the effect, if any, of crystalline anisotropy on the I-V tunneling characteristic. This resulted from a combination of high temperature dependence of tunneling resistance leading to very high values at low temperatures and effects attributed to pickup across the high resistance that resulted. Further work with aluminum appears unlikely of success and attention has been turned to the use of single crystal tin. The performance of superconducting tunneling assemblies as detectors at low radio frequencies has been examined both experimentally and analytically. A description is given of the circuit and the manner in which data were taken. Results are presented typical of the two types of behavior obtained, square law and linear. The effect of the presence of radio frequency on the I-V characteristic is analyzed in detail. The analysis is particularized to the case of superconducting tunneling by use of an equivalent circuit formalism. Expressions are obtained giving the rectified current and voltage in terms of the parameters describing the I-V curve of the device. (Author)

AD-282 325 Div. 25, 9
(TISTP/JW) OTS price $2.50

Plasmadyne Corp., Santa Ana, Calif.
STUDY OF MHD AND EHD FREE-CONVECTION ENERGY CONVERTERS.
Final rept.,
by Meredith C. Gourdine. June 62, 110p. incl. illus. table, 12 refs.
(Contract AF 33(616)8007, Proj. 3145)
(ASD TDR 62-320) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Electromagnetism, *Hydrodynamics, Feasibility studies, Energy, Convection, Magnetic fields, Fluid flow, Conversion ratio.

A theoretical and experimental feasibility study of single and two-phase free-convection MHD and EHD energy conversion is summarized. Single-phase operation is shown to be impractical because the maximum possible efficiency of converting heat into flow kinetic energy is very low. On the other hand, two-phase operation is far more efficient and definitely has possibilities for practical energy conversion applications. (Author)

AD-282 342 Div. 25, 17
(TISTP/JW) OTS price $3.60

Washington State U., Pullman.
AN INVESTIGATION OF THE ADSORPTION AND OTHER PROPERTIES OF ACTIVATED ATMOSPHERIC GASES.
Rept. no. 9 (Final),
by E. E. Donaldson. 31 Dec 61, 23p. incl. illus. tables, refs.
(Contract AF 19(604)6166, Projs. 6687, 7635)
(AFCRL 62-633) Unclassified report

DESCRIPTORS: *Adsorption, *Gas ionization, *Atmospherics, Tungsten wire, Ionization, Spectrographic analysis, Sensitivity, Nitrogen, Electronic circuits, Noise, Measurement.

A study of positive ion emission from tungsten filaments is made in which it is found that the positive ions are produced as continuous currents and as bursts, contributing to noise in tubes. The dependence of the currents on filament temperature and environmental gas is investigated and mechanisms of production are suggested. The operation and calibration of the Bayard-Alpert ionization gauge is investigated. Special emphasis is placed as an inquiry into the sources of non-linearity of the gauge. Chemical sputtering is investigated with a mass spectrograph. The limited investigation at low detection sensitivity has not demonstrated sputtering although a preliminary study has produced a promising method of elevating the work function of a surface ionization source. A further investigation is made of the activated state responsible for enhanced pumping of nitrogen. (Author)

AD-282 343 Div. 25, 18
(TISTW/PCR) OTS price $8.10

Westinghouse Electric Corp., Baltimore, Md.
INVESTIGATION OF OPTICS FOR A RADIATION WEAPON SYSTEM. VOLUME II.
Quarterly technical note (Appendices).
1 May 62, 1v. incl. illus. refs.
(Contract AF 30(602)2638, Proj. 5561)
(RADC TDR 62-276, vol. 2) Unclassified report

DESCRIPTORS: *Lasers, Optical systems, Oscillators, Cavity resonators, Focusing, Amplifiers, Mirrors, Lenses, Feedback, Feedback amplifiers, Coatings, Fire control, Tracking, Radar antennas, Equations, Weapons.

The optical portion of a device for delivering high energy densities of optical frequency electromagnetic radiation to a point in space is discussed. The energy is assumed generated in an active laser material. The problems of extracting this energy coherently and focusing it are considered. Limitations due to optical material considerations and fabrication restraints are investigated. (Author)

AD-282 344 Div. 25
(TISTM/ODN) OTS price $2.60

Catholic U. of America, Washington, D. C.
A MOLECULAR ORBITAL STUDY OF HYDROGEN SUPEROXIDE,
by Roy Furlong and Virginia Griffing. 1962, 20p. illus. 25 refs.
(Contract AF 18(600)1537)
(AFOSR-TN-60-92) Unclassified report

DESCRIPTORS: *Free radicals, *Hydrogen compounds, *Dioxides, *Quantum mechanics, Molecular structure, Chemical reactions, Configuration, Electrons, Matrix calculus, Operators, Atomic orbitals, Hydrogen, Oxygen, Atoms, Chemical bonds, Perturbation theory, Functions, Integrals.

The radical HO2 was established as an intermediate in the hydrogen-oxygen reaction. The radical configuration is considered as that of an isosceles triangle with the O-H distance 1.8 angstrom units and the O-O distance 2.456 angstrom units. Electron states are described by molecular orbitals. An attempt was made to mathematically determine the total energy of the ground state of the radical, the energy levels of its ground state, the promotion of charge in each of the atoms involved, the bonding properties of the various orbitals, and the approximate energy of the lower-lying excited states. A correlation of these results with those for the oxygen molecule is presented. The calculations involve several assumptions.

AD-282 355 Div. 25, 8
(TISTP/WH) OTS price $1.60

Aerospace Corp., Los Angeles, Calif.
SIGNAL FROM THE ELECTRICAL CONDUCTIVITY/VELOCITY METER FOR TENSOR CONDUCTIVITY,
by A. E. Fuhs. 22 May 62, 14p. incl. illus. 3 refs. (Rept. no. TDR-69(2119)TN-5)
(Contract AF 04(695)69)
(DCAS TDR 62-114) Unclassified report

DESCRIPTORS: *Plasma physics, *Electrical conductance, *Electromagnetic waves, *Tensor analysis, *Magnetometers, Transducers.

Formulas are derived for the signal due to plasma flow with tensor conductivity. Two transducer geometries are considered: the E-lamination and the pancake-coil. For the E-lamination transducer, the conductivity is reduced by a factor regardless of plasma flow angle relative to the transducer reference axis. For the pancake-coil transducer, the conductivity is reduced by the same factor. By using a combination DC and AC primary magnetic field, an average value can be measured with the electrical conductivity/velocity instrument. (Author)

AD-282 370 Div. 25, 17, 30
(TISTM/GEC) OTS price $5.60

Michigan U. Coll. of Engineering, Ann Arbor.
INVESTIGATION OF LIQUID METAL BOILING HEAT TRANSFER.
Quarterly progress rept. no. 3, on Phase 2a,
by Richard E. Balzhiser, C. Phillip Colver and others. July 62, 29p. illus. (Rept. no. 04526-5-P)
(Contract AF 33(616)8277)
Unclassified report

DESCRIPTORS: *Liquid metals, *Heat transfer, Boiling, Film boiling, Nucleate boiling, Potassium, Sodium, Thermodynamics, Pressure, Fluid flow, Test equipment, Design, Test methods, Research program administration.

Potassium will be boiled from the outside of a 3/8-in OD Haynes-25 tube at temperatures up to 2000 F and heat fluxes of 10 to the 6th power Btu/hr sq ft. This study is intended to obtain experimental data for the nucleate boiling of potassium at fluxes near the critical. The effect of pressure on the critical flux will be investigated. Film boiling studies employing potassium as the test fluid and sodium as the heating fluid will be conducted. Boiling will occur from a 0.200-in Nb-1% Zr disk in a 1-in Nb-1% Zr tube. A forced circulation liquid metal loop will circulate potassium at liquid flow rates up to 2 gpm. The maximum fluid temperature in the loop will be 1800 F. Potassium will be preheated to various qualities using clamshell heaters. Condensing sodium is used to boil the potassium in the test section. Fluxes of up to 10 to the 6th power Btu/hr sq ft are anticipated. Two phase flow studies will be conducted as a part of the forced circulation investigation. Pressure drop and void fraction measurements will be made for different qualities and flow rates. Loop instrumentation will be used in conjunction with the pool boiling studies. Agravic studies with mercury are scheduled. Studies will be from 1 - 20 g's with the liquid level varied to insure uniform pressures at liquid-vapor and liquid solid interfaces. (Author)

AD-282 376 Div. 25
(TISTP/WH) OTS price $4.60

Physical Electronics Research Lab., Institute of Tech., U. of Minnesota, Minneapolis.
PHOTOEMISSION STUDIES.
Interim engineering rept. no. 1, 16 Dec 61-15 June 62,
by W. T. Perin. 15 June 62, 42p. incl. illus. 25 refs.
(Contract AF 33(657)8041)
Unclassified report

DESCRIPTORS: *Photoemission, *Germanium, *Silicon, *Sodium, Adsorption, Work functions.

A modified version of the ion gun used to deposit Na is described. A brief description of the experimental tube used to check this ion gun is given, and preliminary results of the experiment to determine the dependence of the work function of Ge on Na coverage are given. An electron diffraction tube, constructed for studying the structure of adsorbed sodium on germanium is described. Secondary electron measurements can be made in the same tube. Construction of a field-emission microscope, also for the study of Ge:Na, is discussed. Progress in the obtaining of drybox and argon purification facilities for the synthesis of Na3Sb is reported as are design changes in the tube for Na3Sb film studies. A brief description is also given of a vacuum system to be used in the study of photovoltaic effects in evaporated semiconducting films. (Author)

AD-282 377 Div. 25, 9
(TISTP/WH) OTS price $8.60

Aerophysics Lab., Mass. Inst. of Tech., Cambridge.
MEASUREMENTS OF HELICAL FLOW OF A STRONG ELECTROLYTE WITH AND WITHOUT A TRANSVERSE MAGNETIC FIELD,
by Laurence R. Boedeker and Eugene E. Covert.
Apr 62, 82p. incl. illus. 8 refs. (Technical Rept. no. 23)
(Contract AF 49(638)900)
(AFOSR-2806) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Electrolytes, *Hydrochloric acid, *Fluid mechanics.

An experiment to measure the MHD effects in an electrolyte is described. The configuration investigated is the slow flow of hydrochloric acid in a helix. At very low Reynolds number a transverse magnetic field is found to retard the flow in agreement with existing theory and with existing experimental results obtained using mercury. At higher Reynolds numbers where secondary flow in a helix becomes important the transverse magnetic field is found to reduce this secondary flow. A primary conclusion of this study is that the one fluid model of incompressible MHD flow is valid in the absence of large gradients. (Author)

AD-282 396 Div. 25
(TISTP/WH) OTS price $1.10

Washington U., St. Louis, Mo.
THE APPLICATION OF MAGNETIC RESONANCE TO SOLID STATE PHYSICS.
Final rept.
Aug 62, 7p. incl. illus. (Technical rept. no. 2)
(Contract AF 49(638)808, Proj. 21070)
(AFOSR-3029) Unclassified report

DESCRIPTORS: *Nuclear magnetic resonance, *Solid state physics, *Phosphides.

AD-282 410 Div. 25, 8
(TISTE/CAM) OTS price $8.10

Columbia Radiation Lab., New York.
RESEARCH INVESTIGATION DIRECTED TOWARD EXTENDING THE USEFUL RANGE OF THE ELECTROMAGNETIC SPECTRUM.
Quarterly progress rept. no. 10, 16 Mar-15 June 62,
by R. Novick. 15 June 62, 77p. incl. illus. tables (Rept. no. CU-6-62-sc-78330 Physics)
(Contract DA 36-039-sc-78330)
Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Solid state physics, *Masers, *Lasers, *Magnetrons, *Cryogenics, *Electron tubes, Radio astronomy, Superconductors, Microwave spectroscopy, Molecular spectroscopy, Microwaves, Molecular beams, Atomic spectrum, Hyperfine structure, Spectrographic analysis, Relaxation time, Calcium, Planetary atmospheres, Simulation, Ruby, Cadmium, Sodium, Rubidium, Lithium, Helium, Strontium.

A new program for the study of defects in solids by electron-nuclear double resonance techniques is reported. A precise value of the O-15 magnetic moment has been obtained and compared with the known moment of the mirror nucleus N-15. A 47,000-gauss superconducting magnet has been successfully operated. Precise values for the hyperfine splitting of a rotational transition in HDS have been obtained with the maser beam spectrometer. Final results are reported on the microwave spectrum of O-17H. Precise values for the lifetimes of the first excited resonance state of Cd, Zn, Ca, and Sr have been obtained by level crossing spectroscopy. A new method of level crossing spectroscopy is reported in which backscattered signals are utilized to observe crossings in the presence of heavy trapping. This technique is being applied to the study of atomic collision phenomena in resonance states. A new molecular beam electric resonance apparatus is being constructed for the study of molecular hyperfine structure. (Author)

AD-282 426 Div. 25
(TISTP/JW) OTS price $2.60

Hermann Foettinger Institut (Germany).
VORTEX DEVELOPMENT IN A SEPARATED BOUNDARY LAYER.
Annual summary rept. no. 2,
by H. Schade and A. Michalke. 31 May 62, 22p. incl. illus. table, 22 refs. (Technical note no. 1)
(Contract AF 61(052)412)
Unclassified report

DESCRIPTORS: *Boundary layer, *Jets, Fluid flow, Reynolds number, Laminar boundary layer, Frequency, Flutter, Excitation, Nozzles, Wave characteristics, Stability, Viscosity, Vortices.

An attempt is made to explain the development of vortices in a separated boundary layer by investigating the axisymmetrical jet downstream of a special nozzle. According to stability theory, a shear profile of finite thickness is unstable against wavy disturbances of certain frequencies and wavelengths. If such wavy disturbances are present in the shear layer, it rolls up into discrete vortices according to Rosenhead's analysis. It is found that viscosity, though responsible for the formation of a shear layer, plays no significant role in the process of rolling up at high Reynolds numbers. The frequency of the natural fluctuations and the relation between frequency and wavelength for artificial excitation have been measured; the results are in good agreement with the theory. (Author)

AD-282 434 Div. 25
(TISTM/EJH) OTS price $6.60

Illinois Inst. of Tech., Chicago.
DISSOCIATION ENERGIES OF DIATOMIC MOLECULES BY THE KNUDSEN-TORSION EFFUSION METHOD (DISSOCIATION ENERGY OF GASEOUS S2).
Master's thesis,
by Pranas Budininkas. Jan 61, 58p. incl. illus. tables, 49 refs.
(Contract AF 49(638)346)
(AFOSR-1110)
Unclassified report

DESCRIPTORS: *Dissociation, *Sulfur, Molecules, Atoms, Thermochemistry, Thermodynamics, Gas diffusion, Vapors, Kinetic theory, Gases, Atomic energy levels, Laboratory equipment.

A Knudsen-Torsion effusion apparatus was developed which permits the study of a two-species gaseous equilibrium system at variable pressures and high temperature. In particular, this apparatus is suitable for the determination of the dissociation energies of S2, Se2 and Te2. The dissociation energy of diatomic sulfur, obtained by this method is 76.46 - 1.36 kcal. This value shows that the spectroscopically observed dissociation of diatomic sulfur is into the one normal and one excited atom.

AD-282 445 Div. 25
(TISTP/JW) OTS price $9.10

Electrical Engineering Research Lab., U. of Illinois, Urbana.
CERENKOV RADIATION FROM AN ANISOTROPIC PLASMA,
by Richard Jay Kenyon. 1 June 62, 90p. incl. illus. tables, 33 refs. (Technical note no. 4)
(Contract AF 33(616)7043, Proj. 5237)
(ASD TDR 62-643) Unclassified report

DESCRIPTORS: *Cerenkov radiation, *Plasma physics, Electron beams, Boundary layer, Dielectric properties, Interference, Reflection, Electromagnetic properties, Radiation effects.

The Cerenkov radiation from an anisotropic plasma due to the passage of a spacially bunched, cylindrically shaped, extended beam of electrons is evaluated. Two problems are considered: one in which the plasma is radially unbounded and the other in which the plasma is bounded by an unbounded isotropic dielectric. Solutions for the power radiated, expressed in terms of an equivalent radiation resistance, are obtained by a consideration of the appropriate electromagnetic boundary value problem. Numerical results were obtained by programming these solutions for computation by the digital computer, ILLIAC. An extensive set of curves of radiation resistance as a function of the several variables, plasma frequency, cyclotron frequency, beam velocity, and beam radius, is presented for the unbounded plasma problem. A few typical curves are presented for the bounded plasma problem. The curves for the unbounded plasma show that the Cerenkov interaction in an anisotropic plasma can be 1000 times stronger than that in conventional microwave tubes. The interference effect due to reflections at the plasma-dielectric interface in the bounded plasma can further increase this interaction by as much as an order of magnitude. An experimental device and an experiment performed at X-band are described. (Author)

AD-282 481 Div. 25, 15
(TISTP/TL) OTS price $3.60

Institute of Mathematical Sciences, New York U., N. Y.
ELECTROMAGNETIC THEORY AND GEOMETRICAL OPTICS,
by Morris Kline. Feb 62, 31p. incl. illus.
(Research rept. no. EM-171)
(Contract AF 19(604)5238, Proj. 5635)
(AFCRL 62-34) Unclassified report

DESCRIPTORS: *Electromagnetic theory, *Geometry, *Optics, *Partial differential equations, Quantum mechanics, Series, Functions, Differential equations, Special functions, Diffraction, Reflection, Light.

The relationship of electromagnetic theory to geometrical optics is discussed. There are at least three major reasons for pursuing and clarifying the relationship in question. The first is the purely theoretical or academic problem of building a mathematical bridge between the two domains, electromagnetic theory and geometrical optics. The older bases for asserting that geometrical optics is a limiting case of electromagnetic theory are vague and from a mathematical standpoint highly unsatisfactory. The second major reason for the investigation is a practical one. To solve problems of electromagnetic theory, whether in the range of radio frequencies or visible light frequencies, one should solve Maxwell's equations with the appropriate initial and boundary conditions. However, as is well known, Maxwell's equations can be solved exactly in only a few problems. Hence physicists and engineers, especially those concerned with ultra-high frequency problems, have resorted to the simpler methods of geometrical optics. The investigation serves a third purpose. In principal it is concerned with the relationship between a wave theory and a non-periodic phenonmenon with the latter in some sense a limiting case of the wave theory as a parameter, the wave length in the case of electromagnetic phenomena, goes to zero. (Author)

AD-282 493 Div. 25
(TISTP/JW) OTS price $12.50

David Sarnoff Research Center, Princeton, N. J.
ELECTRONIC SPECTRA OF TRANSITION METAL IONS IN

CRYSTALS. PART II.
Final rept.,
by Donald S. McClure, Santiago R. Polo, and Herbert A. Weakliem. 1 June 61, 1v. incl. illus. tables, 12 refs.
(Contract AF 19(604)5541, Proj. 5621)
(AFCRL-555, vol. 2) Unclassified report

DESCRIPTORS: *Metallic crystals, *Tensor analysis, *Electrons, *Operators (Mathematics), *Matrix algebra, *Functions, Particles, Ions, Spectrophotometers, Crystals.

Contents:
Coordinate transformations
Basis functions, operators
Group-theoretical considerations
Projection operators and symmetry functions
Transformation of the angular momentum eigenfunctions under rotations
Point groups
Symmetry functions
Coupling coefficients
Coupling coefficients for the point groups
Irreducible spherical tensors
Irreducible tensor operators
Coefficients and reduced matrix elements in coupled schemes
Unit tensor operators in spherical basis
The basis functions for n-electron systems
The independent particle representation
The LS-coupling scheme
The crystal-field Hamiltonian

AD-282 494 Div. 25, 15
(TISTP/GRW) OTS price $14.50

David Sarnoff Research Center, Princeton, N. J.
ELECTRONIC SPECTRA OF TRANSITION METAL IONS IN CRYSTALS. PART II. TABLES.
Final rept.,
1 June 61, 1v. incl. tables.
(Contract AF 19(604)5541, Proj. 5621)
(AFCRL-555, Vol. 2) Unclassified report

DESCRIPTORS: *Crystal structure, *Algebra, Functions, Tables.

Contents:
Symmetry linear combinations of angular momentum eigenfunctions. Cubic group O (Cubic axes)
Symmetry linear combinations of angular momentum eigenfunctions. Cubic group O (Trigonal axes)
Coupling coefficients for the cubic group O (Cubic axes)
Tables of 3-j and 6-j coefficients
Reduced matrix elements of crystal field operators between states of the configurations in LS-coupling
Reduced matrix elements of the operators
Matrix elements of rotation operators

AD-282 526 Div. 25
(TISTM/ODN) OTS price $2.60

General Electric Co., Schenectady, N. Y.
RESEARCH ON CdTe.
Quarterly progress rept. no. 5, 1 May-31 July 62,
by R. E. Halsted, M. R. Lorenz and others.
31 July 62, 29p. incl. illus. tables, 7 refs.
(Contract AF 33(616)8264)
Unclassified report

DESCRIPTORS: *Intermetallic compounds, *Cadmium compounds, *Tellurides, *Semiconductors, *Single crystals, Transport properties, Zone melting, Nitric acid, Hydrogen, Fluorides, Potassium compounds, Dichromates, Sulfuric acid, Indium, Platinum, Electrodes, Resistance, Energy, Ionization, Magnetic fields, Electron mass, Infrared radiation, Reflection, Chemical impurities, Optics, Electrical properties.

Electrical transport and optical properties of CdTe crystals were studied. Electron mobilities up to 50,000 sq cm/volt were measured. Results were interpreted with regard to scattering mechanism on the assumption of a single donor level. Magnetoresistance measurements were initiated and IR reflectance data obtained on some n-type doped samples. The electron effective mass was determined as 0.12 + or - 0.02. Both n-type and p-type CdTe single crystals were prepared from the melt. Hole mobility data were explained by optical-mode scattering with some contribution from impurity and/or acoustical-mode scattering. Carrier concentration as a function of temperature is presented for several zone-refined, undoped samples and for impurity-doped samples.

AD-282 527 Div. 25
(TISTM/MS) OTS price $4.60

General Electric Co., Schenectady, N. Y.
INVESTIGATION OF SEMICONDUCTING PROPERTIES OF II-VI COMPOUNDS.
Final rept., 1 June 61-1 June 62,
by M. Aven and H. H. Woodbury. 28 June 62, 39p. incl. illus. 15 refs.
(Contract AF 19(604)8512, Proj. 4608)
(AFCRL-62-557) Unclassified report

DESCRIPTORS: *Semiconductors, *Semiconducting films, *Single crystals, Crystal structure, State physics, Transport properties, Atomic energy levels, Electrical properties, Hall effect, Impurities, Copper, Zinc compounds, Cadmium compounds, Sulfides, Tellurides, Selenides, Thin films, Preparation, Growth.

Using a radioactive tracer technique, it was demonstrated that by firing II-VI compounds in suitable liquid metals, Cu can be effectively extracted from these materials. Energy levels approximately 1 ev below the conduction band edge were found in CdS fired under high sulfur pressures. The presence of these levels appear to fix the Fermi level in semi-insulating CdS, and it has not been found possible to further lower the Fermi level either by very high pressure sulfur firing or the incorporation of the acceptor impurities Cu, Ag or Au. Liquid Cd firing of some high purity CdS samples has yielded a material showing an electron mobility maximum of 11,000 sq. cm/volt sec. Study of the growth habits of CdS on ZnTe showed that an epitaxial deposit of CdS can be obtained only on the (111) Zn faces of ZnTe. Reasons for this finding are discussed in terms of the thermal etch patterns and the bonding characteristics of II-VI compounds. Double injection and negative resistance behavior has been observed in ZnTe-CdS heterojunctions with wide compensated regions between the p and the n parts of the junction. A tentative band model has been proposed for the ZnTe-CdS junctions on the basis of this and other experimental findings. (Author)

AD-282 542 Div. 25, 14
(TISTM/MS) OTS price $6.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE PREPARATION AND PROPERTIES OF SOME VANADIUM SPINELS.
by D. B. Rogers. 25 May 62, 62p. incl. illus. tables, 65 refs. (Technical rept. no. 269)
(Contract AF 19(604)7400)
(AFESD TDR 62-115) Unclassified report

DESCRIPTORS: *Spinels, *Vanadium compounds, Oxides, Crystal structure, Physical properties, Electrical properties, Transport properties, Chemical analysis, Preparation.

The purpose of this thesis was to prepare several mixed oxides of spinel structure containing trivalent or tetravalent vanadium as a principal constituent in order to investigate the possible effect of direct cation-cation interactions (via overlap of cation d orbitals) on the properties of the d electrons. To accomplish this aim, numerous preparative techniques were worked out for this class of materials and the following end-member spinels were obtained in a reasonably high degree of purity as established by x-ray diffraction and chemical analysis: $MnV_2O_4$, $FeV_2O_4$, $MgV_2O_4$, $ZnV_2O_4$, $CoV_2O_4$, $Fe_2VO_4$, and $Co_2VO_4$. Several of the magnetic, electrical transport, and crystallographic properties of these materials were studied. Most of these properties were not readily interpretable in terms of classical mechanisms, but appeared to provide positive experimental evidence for the presence of relatively strong, direct cation-cation interactions. Conclusions were drawn relating to certain characteristics of this latter mechanism. Some amplification of these conclusions was obtained through an extension of the experimental work to include the following mixed systems: $CoV_{2-x}Al_xO_4$ (0 is less than or equal to x less than or equal to 2), $Fe_{1+x}V_{2-x}O_4$ (0 is less than or equal to x less than or equal to 1), and $Co_{1+x}V_{2-x}O_4$ (0 is less than or equal to x less than or equal to 1). The properties of these systems were shown to be qualitatively interpretable in terms of direct interactions. (Author)

AD-282 604 Div. 25
(TISTP/TL) OTS price $3.60

Illinois U., Urbana.
A STUDY OF GAS-SOLID SUSPENSIONS AT HIGH TEMPERATURES AND EFFECT OF ELECTROMAGNETIC FIELDS.
Report on A Cooperative Program of Fundamental Research as Related to Jet Propulsion,
by S. L. Soo. June 62, 23p. illus. 14 refs.
(Proj. Squid technical rept. no. ILL-7-P)
(In cooperation with James Forrestal Research Center, Contract Nonr-185825, Proj. NR-098-038)
Unclassified report

DESCRIPTORS: *Gases, *Solids, *High temperature research, *Electromagnetic fields, *Thermionic emission, Particles, Space charges, Electrical conductance, Magnetohydrodynamics, Zirconium.

A study of equilibrium between thermionic emission from solid particles and space charges of the phases in a gas-solid suspension is presented. It was shown that at magnitudes of temperatures of 1000 K, ionization of the gaseous phase can be neglected, and thermionic emission as opposed by space charges is the major mechanism, and that the time to reach equilibrium is extremely short. Further considerations are given to thermal electrification of a gas-solid system with regard to the following items: (1) effect of material and energy gap of the solid phase; (2) initial charge on the solid particles; (3) electrical conductivity of the suspension; and (4) magnetohydrodynamics of the suspension. (Author)

AD-282 605 Div. 25
(TISTP/TL) OTS price $3.60

James Forrestal Research Center, Princeton U., N. J.
A HIGH INTENSITY MOLECULAR BEAM APPARATUS.
Report on A Cooperative Program of Fundamental Research as Related to Jet Propulsion,
by J. Deckers and J. B. Fenn. June 62, 1v. incl. illus. 12 refs. (Proj. Squid technical rept. no. PR-103-P)
(Contract Nonr-185825, Proj. NR-098-038)
Unclassified report

DESCRIPTORS: *Molecular beams, *Gases, *Supersonic flow, Molecules, Nitrogen, Mach number, Compressible flow, Equations, Vacuum systems, Nozzles, Collimators, Orifices, Ionization gages, Water, Condensation, Methanes, Silicone, Surfaces, Germanium compounds, Oxidation, Shock waves, Pyrolysis.

A high intensity molecular beam apparatus is described which is based on a supersonic stream gas source. Intensities of the order of 10 to the 17th power molecules/sq.cm/sec have been achieved with nitrogen. These represent a substantial fraction of theoretical predictions. The possibility of achieving higher than thermal energies is suggested. Possible applications of the apparatus are outlined. (Author)

AD-282 606 Div. 25
(TISTP/TL) OTS price $4.60

Aeronautical Research Associates of Princeton, N. J.
ON THE RELAXATION OF GASES TOWARD CONTINUUM FLOW.
Report on A Cooperative Program of Fundamental Research as Related to Jet Propulsion,
by J. E. McCune, T. F. Morse, and G. Sandri. June 62, 37p. incl. illus. 14 refs. (Proj. Squid technical rept. ARAP-3-P)
(In cooperation with James Forrestal Research Center, Contract Nonr-185825, Proj. NR-098-038)
Unclassified report

Paper presented at the Third Symposium on Rarefied Gas Dynamics in Paris during the week of 26 June 1962.

DESCRIPTORS: *Gases, *Relaxation time, *Gas flow, *Continuum mechanics, Kinetic theory, Perturbation theory, Partial differential equations, Tensor analysis, Statistical distribution, Statistical functions, Integral equations, Vector analysis, Moments, Superaerodynamics.

The new method to a perturbation of the Boltzmann equation for small Knudsen number at fixed Mach number is applied. To render the expansions uniformly valid for long times, multiple time-scales are introduced and with the new freedom thus obtained secular terms (terms growing in time) are removed. When, in addition, restrictions equivalent to those used in the ordinary Enskog-Chapman theory are applied (namely, that the lowest approximation to the distribution function be a local Maxwellian for large times) the asymptotic (large-time) conditions for the removal of secularity take on a very familiar form. The removal of secularity in the Boltzmann equation leads to the equations for the ''second'' and ''third'' approximations to the distribution function which are identical with those of Enskog-Chapman. (Author)

AD-282 607 Div. 25
(TISTP/TL) OTS price $3.60

James Forrestal Research Center, Princeton, U., N. J.
MOLECULAR BEAMS FROM NOZZLE SOURCES.
Report on A Cooperative Program of Fundamental Research as Related to Jet Propulsion,
by John B. Fenn and Jacques Deckers. June 62, 22p. illus. 8 refs. (Proj. Squid technical rept. no. PR-104-P)
(Contract Nonr-185825, Proj. NR-098-038)
Unclassified report

Paper presented at the International Symposium on Rarefied Gas Dynamics held in Paris from 26-30 June 1962.

DESCRIPTORS: *Molecular beams, *Gases, *Supersonic flow, *Nozzles, Orifices, Collimators, Ionization gages, Shock waves, Molecules, Mach number, Nitrogen, Water, Condensation, Methanes, Silicones, Surfaces, Pyrolysis, Germanium compounds, Oxidation.

A high intensity molecular beam apparatus was built and operated. It is based on the suggestion of Kantrowitz and Grey that supersonic flow into the first defining orifice should result in much higher intensities and much narrower velocity distributions than can be obtained by classical effusive sources. Performance of this system is reviewed and compared with theory. An attempt is made to explain the marked deviations from theory which occur under some conditions. A model is developed which is at least consistent with observed performance and which should be useful in the design and use of such systems. Possible applications of nozzle beams are outlined. Some interesting implications of small scale low density flow are noted. (Author)

AD-282 616 Div. 25, 26
(TISTM/CRJ) OTS price $5.60

Texas Instruments, Inc., Dallas.
RESEARCH AND DEVELOPMENT OF YTTRIUM IRON GARNET SINGLE CRYSTALS.
Final engineering rept., 1 July 61-30 June 62. 2 July 62, 55p. incl. illus. tables, 31 refs.
(Contract NObsr-87241; Continuation of Contract NObsr-77571)
Unclassified report

DESCRIPTORS: *Single crystals, *Garnet, Yttrium compounds, Iron compounds, Ferromagnetic materials, Growth, Spectrographic analysis, X-ray diffraction analysis, Electron microscopy, X band.

Major emphasis was on refining the floating-zone technique to produce single crystal yttrium iron garnets at least 1/2 in. in diameter and 1 in. long with a ferrimagnetic resonance line-width in the X-band frequency range of less than 1 oersted. Yttrium iron garnet (YIG) single crystals 1/4 to 3/8 in. diam with a dielectric constant of about 10 and dissipation factor of 0.002 at 1000 c were produced by this technique. Ferrimagnetic resonance line-widths at X-band of 1.3 oersteds were obtained from polished test spheres. A technique was developed by which several float-zoned specimens were produced with crack-free cross sections. The identity, origin, and means for prevention of a second phase in YIG is discussed. The second phase, a mixture of iron oxide and YIG, was prevented from forming with improved temperature control and slower zoning rates (0.1 in./hr or less). Data are presented from resonance line-width (delta H) measurements at X-band and at C-band. Preliminary results from heat treating experiments indicate that the delta H of YIG test spheres can be reduced by annealing. An improved technique is described for rapid polishing of YIG spheres. Results of chemical and electrical evaluations of float-zoned YIG are discussed. (Author)

AD-282 660 Div. 25
(TISTE/CAM) OTS price $1.60

Army Ordnance Arsenal, Philadelphia, Pa.
COHERENT LIGHT AMPLIFIERS,
by Morton L. E. Chwalow. June 62, 13p. incl. tables, 13 refs.
Unclassified report

Presented at the Laser Coordination Meeting Office, Chief of Ordnance, 27 and 28 June, 1962.

DESCRIPTORS: *Lasers, *Masers, Light, Infrared radiation, Feasibility studies, Theory, Optical systems, Optical images, Infrared optical systems, Electromagnetic waves, Photons, Noise, Signal-to-noise ratio, Magnetic fields, Luminescence, Night sky, Narrowband.

The feasibility of realizing light amplification without forming an image on a focal surface before amplification and transfer thereof is examined. Such a coherent light amplifier could only be realized by applying stimulated emission (maser) processes and techniques. The severe limitations imposed by the spontaneous emission from the excited medium are calculated in detail for imaging devices. Detailed calculations of input power requirements, impurity concentrations, and the possibility of utilizing ambient night illumination are given in the visible and infrared regions of the spectrum. The severity of the attendant problems of image conversion of amplified radiation in the non-visible portion of the spectrum are realized. Available data on the luminescence of objects in moonlight or starlight indicate there is insufficient ambient radiation after dark to overcome photon noise in the narrow band regions of such devices. As an active device with the target artificially illuminated, the amount of energy needed to attain unity signal-to-noise ratio is so great that in the visible region of the spectrum the eye can operate alone without any amplification of the return radiation. (Author)

AD-282 708 Div. 25
(TISTP/GRW) OTS price $1.60

Uppsala U. (Sweden).
STUDY OF ATOMS BY PERTURBATION THEORY,
by Jan Linderberg. 15 Dec 61, 17p. incl. illus. tables, 21 refs. (Technical noe no. 74)
(Contract AF 61(052)351)
(ARL-257) Unclassified report

DESCRIPTORS: *Perturbation theory, *Atoms, Atomic orbitals, Ionization potentials, Electrons, Differential equations, Hydrogen.

A calculation of contributions from singly excited states to the second order perturbation theory energy of an N-electron atom or ion was carried out. A number of integrals relevant to interactions between 1s, 2s, and 2p hydrogen atomic orbitals are evaluated and tabulated. Comparison between calculated and observed term differences and ionization potentials shows fair agreement. (Author)

AD-282 715 Div. 25, 4, 8
(TISTP/JW) OTS price $5.60

Naval Ordnance Lab., Corona, Calif.
FOUNDATIONAL RESEARCH PROJECTS.
Quarterly rept., Apr-June 62.
15 Aug 62, 58p. incl. illus. refs.
(NAVWEPS rept. no. 7229) Unclassified report

DESCRIPTORS: *Heat resistant polymers, *Phosphorus compounds, *Infrared spectroscopy, *Transmission lines, *Computer logic, Semiconductors, Solid state physics, Polymerization, Coding, Spin, Optics, Absorption, Synthesis, Atomic spectrum, Waveguides.

Contents:
Coder components program
Parametron coding circuit study
Ferromagnetic resonance

Spin wave dispersion relation
High temperature polymer program
Polymerization mechanism studies
Nonaqueous electrochemistry
Electroreduction of nitrobenzene in liquid ammonia solutions
Semiconductor physics
Theory of interband magneto-optical effects in the nonabsorbing region

AD-282 740 Div. 25, 8
(TISTP/JW) OTS price $6.60

AVCO Everett Research Lab., Mass.
ELECTRIC SHOCK TUBE FOR HIGH VELOCITY SIMULATION,
by John C. Camm and Peter H. Rose. July 62, 61p. incl. illus. 22 refs. (Research rept. no. 136)
(Contract AF 19(604)7458)
(AFCRL 62-568) Unclassified report

DESCRIPTORS: *Shock tubes, *Fluid flow, *Electric discharges, Capacitors, Gases, Velocity, Growth, Sampling, Energy, Helium, Temperature, Boundary layer.

Shock tubes were developed capable of producing a gas sample of known conditions at velocities as high as 43,000 ft/sec. The driver of these shock tubes employs a capacitor bank which discharges electrical energy into helium, heating the helium to temperatures of 10,000 - 20,000 K, and raising the pressure to 10,000 - 20,000 psi. The high pressure bursts the scribed diaphragm and the resulting shock wave propagates into the test gas. Extensive diagnostic techniques were employed in the resulting hot gas samples. The growth of this sample was observed optically, and correlations were achieved with theoretical calculations. The observed radiation was compared with and can be used to extend the known radiative properties of high-temperature air. Time-resolved luminous pictures and spectra were also taken to show the purity of the test gas. The speed and attenuation of the shock front were measured. The observed operation of this shock tube was compared to theoretical predictions, and although no precise correlation can be made, the driver gas energy transfer and losses in the shock tube boundary layer can be accounted for. (Author)

AD-282 742 Div. 25
(TISTP/WH) OTS price $10.60

Boeing Scientific Research Labs., Seattle, Wash.
DISPERSION OF WAVES IN HOT PLASMAS,
Doctoral thesis,
by Harold B. Liemohn. June 62, 121p. incl. illus. tables, 50 refs. (Rept. no. D1-82-0174)
Unclassified report

Also available from the author.

DESCRIPTORS: *Plasma physics, *Plasma oscillations, *Electromagnetic waves, *Propagation, High temperature research, Damping, Extremely low frequency.

The propagation characteristics of small-amplitude waves in hot plasmas are discussed assuming specific functional forms for the equilibrium distributions. The space-time behavior of initial density perturbations (acoustic mode) is analyzed, including second-order effects, using a one-dimensional Cauchy velocity distribution. For the acoustic mode, the initial density perturbation of the plasma is assumed to be sinusoidal in space. The first-order solution has an exact analytic form which gives damped oscillations at a thermally shifted plasma frequency. The thermal damping is similar to that originally obtained by Landau. The nonrelativistic dispersion equation for the longitudinal extraordinary mode is solved for all frequencies including cyclotron resonance. Solutions of the dispersion equation for a relativistic plasma are calculated at certain frequencies, and the qualitative behavior of the index of refraction is clearly evident from these specific results. Relativistic effects are found to lower the cyclotron resonance and the frequency at which the index vanishes. (Author)

AD-282 741 Div. 25
(TISTP/WH) OTS price $2.60

Brown U. Div. of Applied Matnematics, Providence, R. I.
THERMO-VISCOELASTIC STRESSES IN A SPHERE WITH AN ABLATING CAVITY,
Final rept.,
by T. G. Rogers and E. H. Lee. Aug 62, 21p. illus. table, 10 refs. (Technical rept. no. 6)
(Contract NOrd-18594)
Unclassified report

DESCRIPTORS: *Thermal stresses, *Viscosity, *Elasticity, *Spheres, *Ablation, *Stresses, Integral equations.

Thermo-viscoelastic stresses in a sphere with a concentric spherical cavity are analyzed, for uniform initial temperature, and cavity ablation at an elevated constant surface temperature. The material is considered to be thermo-rheologically simple, with properties prescribed by an isothermal relaxation modulus function and a relaxation time scale factor given as a function of the temperature. The theory is developed in the form of integral equations in time for the radial stress gradient. These lend themselves to numerical solution, and an example is presented of a sphere of polymethyl-methacrylate for which the relaxation modulus function and temperature-log(time) shift function are available. Features of the solution are discussed, and compared with a corresponding elastic case and the previously published solution for an ablating solid sphere. (Author)

AD-282 743 Div. 25, 8
(TISTP/WH) OTS price $1.60

Boeing Scientific Research Labs., Seattle, Wash.
WHISTLER ATTENUATION BY ELECTRONS WITH AN $E^{-2.5}$ DISTRIBUTION,
by H. B. Liemohn and F. L. Scarf. June 62, 9p. illus. table, 9 refs. (Rept. no. D1-82-0176)
Unclassified report

Also available from the author.

DESCRIPTORS: *Electromagnetic waves, *Extremely low frequency, *Electrons, *Temperature, *Damping, *Attenuation, *Distribution, Exosphere.

Identifiers: Whistlers.

The thermal (Landau) attenuation of natural whistler radiation is examined assuming that the electron component has a velocity distribution of the (Cauchy) form $\sim(v^2 + a^2)^{-3}$ which corresponds to an energy dependence of $E^{-2.5}$ when $|v| \gg a$. A temperature of $\sim 10^5$ °K at $R \simeq 4R_e$ geocentric is required in order to explain the observed cutoff at $\omega \simeq 0.6\ \omega_c(0°)$ where $\omega_c(0°)$ is the minimum cyclotron frequency along the path. A simple algebraic expression is obtained for the

electron temperature which makes the analysis of a large number of whistler traces feasible. The exact shape of the distribution and the concept of temperature are only relevant in the sense that they give the fraction of electrons which participate in the damping interaction at the Doppler shifted phase velocity $v_o(\omega) = (\omega - \omega_c)/Re\ k(\omega)$. For a total density of 200 electrons/cm$^3$ at $R \simeq 4R_e$, the thermal attenuation mechanism predicts and electron flux of $\sim 4 \times 10^5$ electrons/cm$^2$ sec eV for energies near 250 eV. (Author)

AD-282 745 Div. 25, 8
(TISTP/JW) OTS price $11.00

Antenna Lab., Calif. Inst. of Tech., Pasadena.
A THEORETICAL STUDY OF THE SCATTERING OF ELECTROMAGNETIC IMPULSES BY FINITE OBSTACLES,
by W. P. Brown, Jr. June 62, 144p. incl. illus.
(Technical rept. no. 28)
(Contract AF 18(600)1113)
(AFOSR-3016) Unclassified report

DESCRIPTORS: *Pulse transmitters, *Electromagnetic properties, *Wave transmission, Wedges, Reflection, Transformations (Mathematics), Vector analysis, Errors, Dielectric properties, Partial differential equations, Scattering.

A general approach to the solution of pulse scattering by finite obstacles is formulated which features the identification and separate treatment of the individual terms in a wavefront expansion of the transforms of the field vectors. It is demonstrated that the dispersive effect of a finite conductivity in the scattering obstacle can be neglected for all metals but that it may be significant for poorly conducting materials such as dry earth. The wavefront technique is employed to solve the problems of the transmission of a delta pulse through a conducting dielectric slab and the reflection and diffraction of a delta pulse from a perfectly conducting sphere. The transmission problem results provide a convenient example of the usefulness of the wavefront approach. The results for the sphere problem indicate that the nature of the waves observed at a given spatial point change in time. It is shown that the penumbra and the caustic region in the vicinity of the focal line are initially of zero extent. The rates of expansion of these regions with increasing time are obtained by a consideration of the error terms in the asymptotic expansions of the fields. The temporal behavior of the near and far field zones is obtained in a similar manner. (Author)

AD-282 748 Div. 25, 8
(TISTP/JW) OTS price $9.10

Chalmers U. of Tech. (Sweden).
DYNAMIC NON-LINEAR WAVE PROPAGATION IN IONIZED MEDIA. 2. THE MAGNETO-IONIC MEDIUM,
by O. E. H. Rydbeck. 1962, 97p. incl. illus.
(Rept. no. US 27)
(Contract AF 61(052)451)
(AFCRL 62-385) Unclassified report

DESCRIPTORS: *Radio waves, *Plasma physics, Tungsten, Fluid flow, Wave characteristics, Magnetic fields, Paramagnetic resonance, Velocity, Density, Polarization, Nonlinear systems.

The dynamic nonlinearities, and the dynamic deformation of the homogeneous magneto-ionic medium is studied. A complete second order non-linear magneto-ionic theory has been developed and is presented with all relevant field, velocity, differential space charge density and polarization expressions. For ionospheric application this theory is adequate under most conditions. Even for the most powerful radio transmitters on the ground, do the second order non-linear relations hold. This is not so in technical plasma devices. However, the second order non-linear theory should be very useful as a tool in studying the further build-up of non-linearities in such devices, since it contains all important non-linear resonances. (Author)

AD-282 756 Div. 25
(TISTP/WH) OTS price $4.60

Hercules Powder Co., Bacchus, Utah.
GENERALIZED PLANE STRAIN OF A PRESSURIZED SPIRALLOY TUBE,
by Bernard W. Shaffer. 1962, 33p. incl. illus. 4 refs.
Unclassified report

DESCRIPTORS: *Stresses, *Elasticity, *Plastic tubing, *Filament wound construction, Matrix algebra, Deformation.

The generalized Hooke's law in cylindrical coordinates is simplified for spiralloy, because of its symmetric winding pattern. It is used in the derivation of the generalized plane strain solution to a closed spiralloy tube subjected to internal pressure. Two sets of equations are found; one set is applicable for compressible spiralloy and the other for incompressible spiralloy. The distinction is also described in terms of the moduli of elasticity and Poissen's ratios. (Author)

AD-282 757 Div. 25, 8
(TISTP/JW) OTS price $2.60

Israel Inst. of Tech., Haifa.
ABSORPTION OF AUDIO-FREQUENCY ELECTROMAGNETIC WAVES TRAVERSING THE IONOSPHERE IN THE MAGNETO-IONIC MODE,
by C. Altman and H. Cory. 12 Jan 62, 20p. incl. illus. tables, 22 refs. (Technical rept. no. 1)
(Contract AF 61(052)555)
(AFCRL 62-544) Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Noise, Wave characteristics, Radiation effects, Ionosphere, Satellite vehicles, Communication systems, Absorption, Very low frequency.

Typical absorption curves for magneto-ionic mode propagation have been calculated for various geomagnetic latitudes and various values of solar zenith angle. The feasibility of communication with satellites beyond the direct line of sight is evaluated, and the connection with 'whistler' and VLF noise radiations is shown. (Author)

AD-282 758 Div. 25, 17
(TISTM/GEC) OTS price $8.10

Illinois U., Urbana.
THERMODYNAMIC PROPERTIES OF ALUMINUM NEAR ITS SUPERCONDUCTING CRITICAL TEMPERATURE,
by Don Carlos Hopkins. July 62, 79p. incl. illus. tables, 45 refs. (Technical rept. no. 3)
(Grant no. DA-ORD-18)
(AROD rept. no. 2771:9) Unclassified report

DESCRIPTORS: *Aluminum, Low temperature research, Metallic crystals, Specific heat, Magnetic field, Superconductors, Measurement, Tests, Test methods, Test equipment, Theory, Phase studies, Phase transitions, Spheres, Mathematical analysis, Single crystals, Thermodynamics.

The specific heat, latent heat and critical field of a single crystalline sphere of 99.995% pure Al have been measured simultaneously between 1.06 and 1.19 K. These quantities are thermodynamically related, but the evidence indicated a discrepancy between the critical field and specific heat much larger than the experimental uncertainty. However, the independently measured thermodynamic properties were found to be much more consistent than previously observed. The specific heat and critical field measurements were consistent with each other within experimental error, but the latent heat deviated by a small but experimentally significant amount from consistency with the other two measured quantities. The detailed shape of the specific heat curve near T sub c was also measured in a magnetic field less than 10 to the -3 power gauss with temperature intervals as fine as 18 x 10 to the -6 power K. Temperature changes as small as 5 x 10 to the -6 power K were detectable with power dissipation of .002 ergs/sec and time constant of 2.5 sec. The transition occurs at 1.180 ± .001 K with a smooth change in specific heat of 2.21 mjoule/mole degree which is complete in about 2 x 10 to the -3 power K. The width and shape of the transition were compared with a calculation based on temperature fluctuations. (Author)

AD-282 782 Div. 25, 8
(TISTP/JW) OTS price $8.10

Louisiana State U. and Agricultural and Mechanical Coll., Baton Rouge.
ELECTRON TRANSPORT PHENOMENA IN ZINC AT LIQUID HELIUM TEMPERATURES,
by C. G. Grenier, J. M. Reynolds and N. H. Zebouni. July 62, 61p. illus. (Interim technical rept. no. 2)
(Grant DA-ORD-31-124-61-G76, Proj. 59901004)
(AROD rept. no. 1579.9)
Unclassified report

DESCRIPTORS: *Magnetic fields, *Thermoelectricity, *Transport properties, Thermal stresses, Electrical properties, Single crystals, Zinc, Helium, Quantum mechanics.

The magnetic field dependences of the electrical and thermal resistances, the thermoelectric power, the Hall, the Righi-Leduc, the Peltier, the Ettingshausen, and the Ettingshausen-Nernst effects at liquid helium temperatures in magnetic fields up to 14 KG, have been investigated in a single crystal of zinc. The measurements were taken with either a constant heat current or a constant electric current flowing perpendicular to the hexagonal axis and with the magnetic field parallel to the hexagonal axis. The results for the logitudinal effects (the thermal and the electrical conductivities, and the thermoelectric and the Peltier coefficients) are consistent, within the experimental error, with recent quantum mechanical conductivity theories. (Author)

AD-282 792 Div. 25, 17
(TISTP/JW) OTS price $5.60

Polytechnic Inst. of Brooklyn, N. Y.
SUMMARY OF RESEARCH ON REINFORCED AND UNREINFORCED CYLINDRICAL SHELLS 1952-1961.
by Joseph Kempner. July 62, 48p. 46 refs. (PIBAL rept. no. 598)
(Contract Nonr-83914, Proj. NR 064-167)
Unclassified report

DESCRIPTORS: *Cylindrical bodies, *Stresses, *Submarines, Spheres, Stability, Linear systems, Nonlinear systems, Elasticity, Reinforcing material, Buckling, Fatique (Mechanics), Analysis.

The work over the past 10 years was primarily concerned with static stress and stability analyses of reinforced and unreinforced cylindrical shells. Within this framework linear and nonlinear stress analyses, linear and nonlinear buckling analyses, and inelastic analyses were carried out. The summary reflects the material presented in 25 PIBAL reports as well as in related publications and theses. (Author)

AD-282 796 Div. 25
(TISTW/DLW) OTS price $2.60

Quantatron, Inc., Santa Monica, Calif.
RESEARCH LEADING TO THE DEVELOPMENT OF AN ULTRAVIOLET RADIATION DEVICE.
Interim summary rept., 30 Apr-15 July 62,
by T. H. Maiman, M. J. Ozeroff, and R. F. Wuerker.
31 July 62, 19p. incl. illus. table, ref.
(Contract DA 04-495-ORD-3503)
Unclassified report

DESCRIPTORS: *Lasers, *Ultraviolet research, *Ultraviolet spectroscopy, Ultraviolet radiation, Flash lamps, Gadolinium, Gadolinium compounds, Calcium compounds, Fluorides, Crystals, Design, Ultraviolet equipment.

Applied research efforts are concerned with the development of an ultraviolet laser device. The method of approach is a spectroscopic investigation of the trivalent gadolinium ion. In particular, gadolinium-doped calcium fluoride crystals and certain gadolinium liquids are investigated. A proper pumping source for an ultraviolet laser, which is rich in ultraviolet radiation at wavelengths shorter than the output wavelength (3110 A) and is also capable of extremely high radiation intensities, is required. Since no such source presently exists, the development of a suitable flash tube is also discussed. (Author)

AD-282 804 Div. 25, 17
(TISTM/EJH) OTS price $2.60

Stanford U., Calif.
THE TEMPERATURE DEPENDENCE OF REACTIONS, WITH SPECIAL REFERENCE TO CREEP,
by Darrell E. Munson and Robert A. Huggins.
Nov 61, 21p. incl. illus. 12 refs. (Technical rept. no. 6; DMS rept. no. 61-17)
(Contract Nonr-225(34), Proj. NR 031-577)
Unclassified report

DESCRIPTORS: *Reaction kinetics, *Creep, *Metals, Thermodynamics, Temperature, High temperature research, Stresses, Differential equations, Theory.

A general treatment is presented of the temperature dependence of the kinetics of multi-step thermally activated reactions. The case of a stress-dependent reaction involving steps with different stress functions is discussed. Observations are included on the process of high temperature creep. (Author)

# Division 25 - PHYSICS

AD-282 806 Div. 25, 8
(TISTP/JW) OTS price $4.60

General Electric Co., Santa Barbara, Calif.
BLAST WAVE SOLUTIONS IN HYDRODYNAMICS.
Final rept.,
by G. M. Schindler and A. Trampus. May 62, 37p. incl. illus. tables, 14 refs. (Rept. no. RM 62TMP-44)
(Contract DA 49-146-XZ-038)
(DASA 1291) Unclassified report

DESCRIPTORS: *Hydrodynamics, *Electromagnetic waves, Radiation effects, Particles, Pressure, Density, Energy, Boundary layers, Fluid flow.

Spherically symmetric blast waves of similarity type are considered. Varying pressure and density of the ambient medium and some heat flow and energy loss due to radiation are also considered. The two-dimensional particle-in-cell method applied to blast wave problems involving more than one material is described. A new approach to axial symmetric blast waves making maximum use of intrinsic geometrical properties is presented. (Author)

AD-282 817 Div. 25
(TISTM/EJH) OTS price $6.60

Theoretical Chemistry Lab., U. of Wisconsin, Madison.
TABLES OF COLLISION INTEGRALS FOR GASES OBEYING THE MORSE POTENTIAL.
Rept. on Theoretical Foundations for Properties of High Temperature Gases,
by S. E. Lovell and J. O. Hirschfelder. 29 June 62, 61p. incl. tables, 10 refs. (Rept. no. WIS-AF-21, Series 5)
(Contract AF 33(657)7311, Proj. 1013)
Unclassified report

DESCRIPTORS: *Gases, *Kinetic theory, *Integrals, Thermodynamics, Tables.

Tables of the first 21 of the Chapman-Enskog collision integrals are presented along with certain commonly used ratios. Values are tabulated for 42 temperatures (reduced) and for 7 values of the free parameter in the potential. (Author)

AD-282 836 Div. 25, 17
(TISTM/GEC) OTS price $1.50

Directorate of Materials and Processes, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
A STUDY OF QUENCH HARDENING IN PLATINUM AND GOLD.
Rept. for Dec 60-Jan 61 on Solid State Research and Properties of Matter,
by Harold Louis Gegel. May 62, 51p. incl. illus. tables.
(Proj. 7353)
(ASD TDR 62-329) Unclassified report

DESCRIPTORS: *Platinum, *Gold, Hardening, Crystals, Crystal structure, Deformation, Recovery, Tensile properties, Mechanical properties, Cooling, Temperature, Processing, Heat treatment, Aging.

Vacancy complexes were formed during the quenching period when the average quenching speed was less than 10 to the 5th power degree C/sec. The binding energy for divacancies in Au was estimated to be approximately 0.28 ev. The influence of increased quenching speeds is to increase the temperature recovery range for isochronal recovery. Similarly, fast quenching rates caused an incubation period in the isothermal aging experiments for Au. No incubation period was observed for Pt. The incubation period is attributed to the time necessary to develop vacancy complexes which have the appropriate geometry to influence the yield strength. The activation energy for recovery in the quench-hardened Pt was determined to be 1.43 ev, which is less than the activation energy for self-diffusion. It was observed to be approximately equal to the sum of the constriction energies for screw and edge dislocations. The activation energy for Au is greater than that for self-diffusion. Two distinct hardening mechanisms exist for Pt and Au when the values of the activation energy for recovery are taken into account. The hardening mechanism for Au is thought to be due to the interaction of dislocations with extended sessile dislocations. (Author)

AD-282 841 Div. 25
(TISTP/GRW) OTS price $4.60

Cornell U., Ithaca, N. Y.
CONTRIBUTION TO THE THEORY OF INELASTIC MOLECULAR COLLISIONS,
by Jerome Weinstock. 1959, 46p. illus. 23 refs.
(Contract AF 18(603)111)
(AFOSR-338) Unclassified report

DESCRIPTORS: *Inelastic scattering, *Relaxation time, *Perturbation theory, Probability, Differential equations, Wave analysis, Energy.

The validity of the distorted wave (dw) approximation for the solution of the vibrational energy transfer problem is investigated. The behavior of the transition probability integral is shown to be determined by the behavior of its integral at a single point. This critical point is used to obtain an exact solution of the transition probability with which the dw solution is compared. The dw solution is found to lie within 20% of the exact solution whenever the transition probability is less than roughly 0.6. The existence of the critical point leads to a simple expression for the transition probability in terms of an arbitrary interaction potential. The effects of adiabatic changes due to short range repulsive forces are investigated by means of the method of perturbed stationary states. (Author)

AD-282 844 Div. 25, 17
(TISTM/GEC) OTS price $1.00

Dayton U. Research Inst., Ohio.
X-RAY DIFFRACTION INVESTIGATIONS ON IRON WHISKERS.
Final rept. for 24 Apr 59-31 Jan 62 on Characterization of Solid Phase and Interphase Phenomena in Crystalline Substance,
by Werner R. Rambauske and Ronald R. Gruenzel. June 62, 31p. incl. illus. tables, 7 refs.
(Contract AF 33(616)6607, Proj. 7353)
(ASD TDR 62-331) Unclassified report

DESCRIPTORS: *Iron, *Single crystals, Metallic crystals, Lattices, Microstructure, Growth, Tests, Mathematical analysis, Computers, X-ray spectrometers, Design, X-ray diffraction analysis.

Iron whiskers have been investigated by x-ray diffraction. The Laue method is employed to determine the orientation of the lattice planes. For a series of hexagonal type whiskers it was found that the lateral face, which according to earlier reports belongs to a (110) plane orientation, belongs to a (211) plane orientation. In another series of whiskers which were grown in one boat condition, a twist of the lattice in-

dices of direction over the whisker length was found. This twist is not visible optically. Necessary exposure times and degree of information obtainable from Laue-diffraction are determined. Higher resolution over the whisker length is necessary to find variations in the parameters, which determine the microstructure of the whiskers. To achieve this resolution, experimental ways are proposed and in progress. Digital computation for analysis of data is reported. (Author)

AD-282 848 Div. 25, 8
(TISTP/JW) OTS price $7.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
MICROWAVE STUDIES OF NONIONIZING SHOCK WAVES. PART II. A PROPOSED MICROWAVE REFLECTION METHOD FOR THE STUDY OF HIGH ENERGY SHOCK WAVE PRODUCED HIGH DENSITY PLASMA,
by S. Takeda, L. Goldstein, and M. Roux.
1 July 62, 66p. incl. illus. table, 19 refs.
(Technical rept. no. 2)
(Contract DA 36-039-sc-78313) Unclassified report

DESCRIPTORS: *Semiconductors, *Microwaves, *Shock waves, Plasma physics, Measurement, Reflection, Electrons, Gases, Ionization, Mach number.

The interaction of microwaves with gaseous plasmas is used to study weak shock waves in low pressure gases. An improved technique for microwave measurement of plasma parameters is used by which the electron density and the collision frequency in a plasma are deduced from the simultaneous recording of two microwave detector signals. The validity of this method was tested in a decaying plasma created by a pulsed DC discharge in the usual way. In this method the gas is weakly pre-ionized and shock waves with a Mach number too low to ionize the gas are then propagated. Using a tube 5mm in diameter and condenser discharges for the production of shock waves up to 200 joules with Mach number up to 5 in a pressure of 4 to 13 mmHg in Neon and Argon, the measured electron density increased across the shock discontinuities in the ratio of the gas density ratio. The electron temperature is lower than the gas temperature estimated from the Mach number. In addition to the electromagnetic behavior the optical properties of the plasma are used and provide an independent source of information directly correlated with the microwave measurements. A method for measuring the higher electron densities in plasmas is proposed. (Author)

AD-282 849 Div. 25
(TISTM/ODN) OTS price $1.25

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION STUDY OF SEMICONDUCTOR ELECTRODES.
Final rept., Feb-Dec 61,
by I. R. Tannenbaum. June 62, 35p. incl. illus. tables.
(Contract AF 33(616)7939, Proj. 3145)
(ASD TDR 62-89) Unclassified report

DESCRIPTORS: *Semiconductors, *Electrodes, *Electrolytic cells, Nickel compounds, Zinc compounds, Oxides, Reaction kinetics, Electric potential, Phenanthrenes, Anthracenes, Fuel cells, Electrochemistry, Processing, Sodium compounds, Hydroxides, Test equipment, Electrical equipment, Theory, Preparation.

This work is of a preliminary nature to investigate the parameters of semiconductor electrodes. Four electrodes, lithiated NiO, ZnO, anthracene and phenanthrene, have been studied. Sample preparation is described, overvoltage, specific reaction rate constants, stoichiometric number, rate limiting steps, exchange currents and equilibrium potentials are determined, and the application of these data to fuel cell technology is discussed. (Author)

AD-282 861 Div. 25
(TISTW/DLW) OTS price $6.60

Motorola, Inc., Chicago, Ill.
CRYSTAL UNITS WITH IMPROVED TEMPERATURE CHARACTERISTICS.
Rept. no. 4 (Final), 1 May 61-30 June 62,
by R. Munn and K. Krieger. 30 June 62, 1v. incl. illus. 9 refs.
(Contract DA 36-039-sc-87271, Proj. 3A-99-15-004)
Unclassified report

DESCRIPTORS: *Quartz crystals, *Quartz resonators, Frequency shift, Crystal holders, Temperature, Vibration, Aging, Hysteresis.

Methods of applying forces to quartz crystals were investigated. These included peripheral sliding devices, which were limited by frictional forces, chordal forces, which proved to be insensitive, and diametral forces which were found to be the most satisfactory. An investigation of materials which might be used to produce nonlinear forces due to non-linear expansion characteristics with temperature revealed that, while certain titanates of barium exhibited nonlinearities, hysteresis effects were prohibitively large. A technique was evolved whereby the compensating elements could be set at any specified temperature, thus eliminating procedures involving the accurate measurement and setting of gaps between the bimetal arms and crystal edge. In addition to the effects of temperature on the compensated quartz units, some aging data was obtained and the performance under conditions of vibration at various frequencies was determined. (Author)

AD-282 887 Div. 25
(TISTP/WH) OTS price $2.60

Yale U., New Haven, Conn.
FORMULAS FOR ESTIMATING WIDTHS OF SPECTRAL LINES EMITTED FROM PLASMAS AND THEIR LIMITS OF VALIDITY,
by Henry Margenau. 1956, 14p. illus. 3 refs.
(Contract AF 18(603)15)
(AFOSR TN 60-779) Unclassified report

DESCRIPTORS: *Atomic spectrum, *Magnetic fields, *Plasma physics, Helium, Hydrogen.

General directives are given for estimating the width of spectral lines broadened by Stark effects. The approach involves defining physical conditions under which impact and statistical regions are valid, and in each case the regime of the Doppler effect is held in view. Three different regions in the n-T plane are distinguished, and plotted, n being the number density of ions (electrons) and T the absolute temperature. In region I both electrons and ions can be treated by impact theory. In II, ions are subject to statistical and electrons to impact description, whereas in III both behave statistically. Circled numbers in the diagrams refer to equations in the text which are appropriate for the calculation of half-widths in each region. (Author)

# Division 25 - PHYSICS

AD-282 890 Div. 25
(TISTP/WH) OTS price $4.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
THE PERFORMANCE AND TEMPERATURE OF A GASEOUS NITROGEN STABILIZED ARC PLASMA GENERATOR,
by L. E. Brewer, W. K. McGregor, and M. T. Dooley. Aug 62, 35p. incl. illus. 12 refs.
(Rept. no. AEDC TDR 62-113)
(Contract AF 40(600)1000)
Unclassified report

DESCRIPTORS: *Plasma jets, *Nitrogen, *Spectrographic analysis, *Electric arcs, Electric discharges.

A direct-current, arc-excited plasma generator, is described. The operating characteristics (voltage vs current, power vs increase in enthalpy, and efficiency) are discussed. For this generator, applied power ranged from 10 to 40 kw which changed the gas enthalpy by as much as 1100 kcal/kg up to 2300 kcal/kg. A spectrometric temperature measuring method is presented, and the plasma stream temperature profile as determined by the method is given. Nitrogen was used exclusively as a working fluid. (Author)

AD-282 894 Div. 25
(TISTP/TL) OTS price $5.60

General Electric Co., Syracuse, N. Y.
FIVE THEORETICAL PLASMA STUDIES.
June 62, 47p. incl. illus. (Technical note no. 11)
(Contract AF 30(602)1968, Proj. 5561)
(RADC TDR 62-260) Unclassified report

DESCRIPTORS: *Plasma physics, *Electromagnetic waves, *Gas ionization, *Microwaves, *Shock waves, Partial differential equations, Integration, Density, Electrons, Bessel functions, Series, Transformations (Mathematics), Reflections, Conductivity, Statistical functions, Statistical distribution, Taylor's series, Radiofrequency, Re-entry vehicles, Re-entry aerodynamics, Differential equations, Energy.

Contents:
Electromagnetic propagation in an exponential ionization density
The conductivity of slightly ionized gases
Reflection of a TE wave from an inverse parabolic ionization density
The rf reflectance of plasma sheaths
Response of a shock ionized layer to high power rf fields

AD-282 898 Div. 25
(TISTP/TL) OTS price $6.60

Aerospace Corp., Los Angeles, Calif.
THE MAGNETOHYDRODYNAMIC FLOW PAST A NONCONDUCTING FLAT PLATE IN THE PRESENCE OF A TRANSVERSE MAGNETIC FIELD,
by D. M. Dix. 25 Apr 62, 58p. incl. illus. tables, 11 refs. (Rept. no. TDR-930(2230-03) TR-2)
(Contract AF 04(647)930)
(DCAS TDR 62-88) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Sheets, *Magnetic fields, *Fluid mechanics, *Fluid flow, Difference equations, Electrical conductance, Intensity, Numerical analysis, Digital computers, Velocity, Transport properties, Electromagnetic effects.

Magnetohydrodynamic flow past a nonconducting flat plate in the presence of transverse magnetic fields is analyzed. The appropriate extension of the Rayleigh problem to the magnetohydrodynamic case yields solutions which correctly predict some features of the steady flow past a semi-infinite flat plate; in addition, the knowledge of these significant features permits an easy evaluation of their magnitudes in other extensions of the Rayleigh problem. The flow past a semi-infinite flat plate is analyzed by two methods. First, by linearizing the governing equations and incorporating the assumption of a low ratio of viscous to magnetic diffusivity, the results for skin friction and the normal component of magnetic field at the plate are obtained, and are shown to be useful in interpreting the character of these low conductivity flows. Second, the complete set of governing equations is formulated as a finite difference problem and solved numerically on a digital computer. The results obtained show that the disturbance produced by the plate is no longer confined to a thin viscous layer if the ratio of viscous to magnetic diffusivity is greater than 1/100, but that an appreciable Alfven type disturbance is excited. (Author)

AD-282 899 Div. 25, 8
(TISTP/JW) OTS price $5.60

Aerospace Corp., Los Angeles, Calif.
AN EXPERIMENTAL STUDY OF THE PROPAGATION OF HYDROMAGNETIC WAVES IN A PLASMA,
by Ieuan R. Jones and Roy W. Gould. 5 Apr 62, 48p. incl. illus. 24 refs. (Rept. no. TDR-930(2210-02)TR1)
(Contract AF 04(647)930)
(DCAS TDR 62-112) Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Plasma physics, *Magnetohydrodynamics, Wave characteristics, Propagation, Excitation, Velocity, Ion beams, Signal generators, Magneto-optic rotation, Fluid flow, Hydrodynamics.

The n = ± 1, E mode of hydromagnetic wave propagation has been studied in a cylindrical plasma waveguide. Excitation at 1.0, 2.3, and 3.0 megacycles per second was achieved by means of a circular current-carrying loop immersed in the plasma. Magnetic probes, distributed along the length of the waveguide and capable of insertion along a radius, were used to determine the radial dependence and direction of the signal fields and, hence, the nature of the propagating mode. These probes were also used to detect the propagation of the waves. Measurement of wave velocity was interpreted to yield the ion density in the plasma, and, furthermore, measurement of wave velocity at different intervals after plasma preparation was interpreted to yield the ion density decay rate. Experiments were performed to detect the rotation of the plane of polarization of the signal fields. (Author)

AD-282 916 Div. 25, 5, 8
(TISTP/WH) OTS price $4.60

Bay State Electronics Corp., Boston, Mass.
NON-LINEAR TRANSPORT TECHNIQUES FOR DECREASING IONIZATION IN PLASMAS,
Final rept.,
by Robert M. Snow. 27 July 62, 36p. incl. illus.
(Contract AF 19(628)299, Proj. 8653)
(AFCRL 62-574) Unclassified report

DESCRIPTORS: *Plasma physics, *Electromagnetic fields, *Electrons, *Radio communication systems, *Transport properties, *Ionization.

Techniques for reducing plasma ionization to

restore communications are discussed. Techniques whereby electrons are physically moved over significant distances by utilizing nonlinear processes in the interaction of electrons and radiation are investigated. Calculations indicate that by irradiating the plasma with the appropriate types of electromagnetic field, significant transport effects can be obtained. A systematic perturbation procedure is used for calculating such effects, leading to a 'pseudostatic field' which acts primarily on electrons while essentially ignoring particles of heavier mass. The pseudostatic field is a convenient artifice for the simplified description of dynamic trajectory effects; its status in this respect is strictly analogous to that of the classical 'Coriolis force'. (Author)

AD-282 918 Div. 25
(TISTP/WH) OTS price $3.60

Colorado U., Boulder.
STATIONARY PRINCIPLES FOR OPERATOR EQUATIONS WITH APPLICATIONS TO ELECTROMAGNETIC THEORY.
Scientific rept. no. 3, June 59-Dec 60,
by R. Mitra. 27 Nov 61, 25p. incl. illus.
3 refs.
(Contract AF 19(604)4556)
(AFCRL-1111) Unclassified report

DESCRIPTORS: *Electromagnetic theory, *Integral equations, *Differential equations, *Operators (Mathematics), Waveguides, Antennas.

An approach is investigated which, starting from differential or integral equations, leads to stationary forms of expressions for certain quantities such as the self-impedance of an antenna, the radiation pattern, etc. For certain simple geometries, not necessarily separable, it is shown that it is possible to obtain an improvement for the unknown field itself. (Author)

AD-282 943 Div. 25
(TISTP/WH) OTS price $4.60

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
THE PROPAGATION OF ULTRASONIC WAVES IN ALKALI HALIDE SINGLE CRYSTALS,
by Emmanuel P. Papadakis. June 62, 44p. incl. illus. tables (Technical rept. no. 170)
(Contract Nonr-1841(0), Proj. NR-018-801)
Unclassified report

DESCRIPTORS: *Single crystals, *Chlorides, *Alkali metals, *Ultrasonic radiation, *Propagation, Sodium compounds, Potassium compounds, Attenuation, Diffraction.

Ultrasonic diffraction, internal conical refraction, and attenuation in NaCl and other materials were studied by the pulse-echo method. In the same manner the elastic constants of NaCl were also determined, while their rates of change with temperature were found by pulse-echo interferometry. Ultrasonic diffraction of compression waves was observed along the pure-mode axes in NaCl as well as along the (100) direction in KCl and in one direction in isotropic steel. Diffraction of the Fresnel type occurred and was strongly dependent upon the anisotropy of the material and the shape of the input wave front. Internal conical refraction of shear waves was observed by selective absorption in the (111) direction in NaCl and in the (100) direction in trigonal CaCO3. The attenuation of 5 to 200 Mc waves was measured for all the pure modes in NaCl and was found to vary as f squared times omega (f = frequency; omega = orientation factor) in accordance with dislocation-damping theory. The attenuation decreased under X-ray irradiation for modes with omega not equal to zero, but held constant for omega equal to zero. Theoretical approaches for deriving the diffraction effect and the rates of change of the elastic moduli with temperature are suggested. (Author)

AD-282 949 Div. 25
(TISTP/FR) OTS price $7.60

General Telephone and Electronics Labs., Inc., Palo Alto, Calif.
ELECTRICAL BREAKDOWN IN THE ATMOSPHERE.
Final rept.,
by A. D. MacDonald, H. W. Bandel and others.
16 May 62, 67p. incl. illus. table, 11 refs.
(Contract AF 30(602)2501, Proj. 5561; Continuation of Contract AF 30(602)2261)
(RADC TDR 62-286) Unclassified report

DESCRIPTORS: *Electric fields, Microwaves, Atmosphere, Air, Nitrogen, Oxygen, Hydrogen, Electrons, Experimental data.

Results of experiments on breakdown electric fields at L-, X-, and K-band over a large pressure range and in a large number of resonant cavities of different sizes are given. Progress in the beam-type experiments designed to measure attachment and collision cross-sections at very low energies is described. A method of using the experimental data to predict breakdown fields under both pulsed and cw conditions is described. It is considered unlikely that further experimental data on electrical breakdown in the atmosphere at pressures ranging from atmospheric to that at 100 km altitude, and in the frequency range of 100 Mc/s to 100 kMc/s, would lead to conclusions different from those contained herein. (Author)

AD-282 971 Div. 25
(TISTP/TL) OTS price $4.60

Oregon State U., Corvallis.
LIGHT EMISSION CHARACTERISTICS DURING EARLY STAGES OF MICROWAVE PLASMA FORMATION.
Final rept.,
by J. J. Brady, A. E. Tynes, and M. F. Anderson.
Mar 62, 45p. incl. illus. tables, 29 refs.
(Contract AF 19(604)5962, Proj. 5634)
(AFCRL 62-555) Unclassified report

DESCRIPTORS: *Plasma physics, *Microwaves, *Light, Spectrographic analysis, Gas discharges, Helium, Gases, Uranium, Quartz, Diffusion, Chemical impurities, Cathode ray tubes, Degasification, Oscilloscopes, Photomultipliers.

A spectrographic study of the light emission from pulsed microwave discharges in pure helium was undertaken to obtain the temporal behavior of individual spectrum lines. The spectral time-resolution equipment used in this study has a spectral resolution of 0.1 angstroms in the first order and a time resolution of 5 nanoseconds. The helium gas used is purified by uranium gettering, quartz diffusion, and cataphoretic separation. The impurity level is believed to be less than one part in 10 to the 8th power. (Author)

AD-282 976 Div. 25, 8
(TISTP/JW) OTS price $10.10

Raytheon Co., Waltham, Mass.
RESEARCH ON A PASSIVE SOLID STATE LIMITER.

Final rept.,
by U. Milano, E. Schlomann and J. Green.
30 Apr 62, 119p. incl. illus. 29 refs. (Rept. no. S-434)
(Contract AF 19(604)7297, Proj. 5621)
(AFCRL 62-389) Unclassified report

DESCRIPTORS: *Microwaves, *Ferromagnetic materials, Resonance, Relaxation time, Magnetic fields, Boundary layer, Stability, Limiters.

The results of theoretical and experimental investigations of basic phenomena involved in the operation of microwave ferromagnetic limiters are presented. These results concern in particular: contribution of the three-magnon relaxation processes to the relaxation rate observed in ferromagnetic resonance experiments; extension of the original theory of parallel-pumped instabilities to a case in which exact boundary conditions have to be taken into account; behavior of the magnetic susceptibility above threshold; transient response to a strong rf magnetic field; and possible extension of limiters utilizing first-order nonlinear effects at resonance to frequencies higher than the ones presently attainable. The different problems connected with the realization of practical microwave ferromagnetic limiters are analyzed and experimental results are presented concerning: properties of the materials to be used; microwave structure; and transient behavior. The results obtained on a microwave limiter utilizing a new microwave structure in the form of a ridged-waveguide section are presented. (Author)

AD-282 979 Div. 25, 8
(TISTP/TL) OTS price $10.50

Syracuse U. Coll. of Engineering, N. Y.
MICROWAVE APPLICATIONS OF SOLID STATE MATERIALS.
Final rept. on pt. 1,
by Harry Gruenberg, Stephen N. Andre and others.
Apr 62, 132p. incl. illus. tables, refs. (Rept. no. EE850-6204F1)
(Contract AF 30(602)2405)
(RADC TDR 62-188, vol. 1)
Unclassified report

DESCRIPTORS: *Parametric amplifiers, *Ferromagnetic materials, *Magnetostriction, Spheres, Circuits, Cavity resonators, Frequency, Resonance absorption, Impedance, Couplings, Electromagnetic field, Microwave equipment, Matrix algebra, Yttrium compounds, Iron compounds, Garnet, Partial differential equations.

The experimental work done on ferrimagnetic amplifiers showed little improvement. Most of the effort was therefore expended on theoretical problems in order to determine the reasons for the poor operation of ferrimagnetic materials as compared to present day parametric amplifiers using diodes. The results are reported in three sections: (1) Analysis of a longitudinally-pumped ferrimagnetic amplifier; (2) Magnetostatic modes in ferrimagnetic spheres; and (3) Synthesis of an optimum matched 3-port microwave junction with equal power split. (Author)

AD-282 993 Div. 25
(TISTP/WH) OTS price $4.60

Aerospace Corp., Los Angeles, Calif.
EFFECT OF JOULE HEATING ON THE PROPAGATION OF MICROWAVES TRANSVERSE TO A FLOWING PLASMA,
by Melvin Epstein. 20 June 62, 39p. incl. illus. 3 refs. (Rept. no. TDR-69(2230-08)TN-1)
(Contract AF 04(695)69)
(DCAS TDR 62-134) Unclassified report

DESCRIPTORS: *Gas flow, *Gas ionization, *Microwaves, *Heating, *Propagation, *Plasma physics.

An approximate analysis is made of the effect of microwave heating on the electron density distribution and propagation characteristics of a slightly-ionized gas flowing transverse to the direction of microwave propagation. Consideration is restricted to the limiting case in which the gas is assumed to be in complete equilibrium. An analytical solution is obtained by linearizing the equations under the assumption that the part of the Joule heating which goes into ionization is small compared to the flux of kinetic energy. Calculations are performed for typical shock tube conditions using argon as a working fluid in order to determine what power levels would be required to observe this type of interaction. The calculations indicate that standard, off-the-shelf cw X-band microwave equipment would be just about capable of providing an interaction strong enough to be detectable. (Author)

AD-282 994 Div. 25, 8
(TISTP/JW) OTS price $3.60

AVCO Everett Research Lab., Mass.
THEORETICAL AND EXPERIMENTAL STUDY OF AN UNPROTECTED SUPERCONDUCTING COIL GOING NORMAL,
by Z. J. J. Stekly. May 62, 35p. incl. illus. 5 refs. (Research rept. no. 135)
(Contract AF 04(694)33)
(BSD TDR 62-116) Unclassified report

DESCRIPTORS: *Superconductivity, *Electromagnetic waves, Voltage, Electric currents, Deterioration, Metal coatings, Energy, Propagation.

A theoretical analysis is presented for the propagation of the normal region in a series wound superconducting coil without protective circuitry. The propagation of the normal region is expressed as a variable resistance with time, which then allows the solution of the electrical circuit equations to yield the current, voltage across the normal region and the local energy dissipation during the decay transient. Good agreement of the predicted currents and voltages with experimental results is obtained. The effect of coil energy, as well as metal coating on the conductor on the voltages and on the energy dissipated per unit length of wire at the initial normal point during the decay transient, are evaluated. (Author)

AD-283 009 Div. 25
(TISTW/DLW) OTS price $.75

Bell and Howell Research Center, Pasadena, Calif.
STUDY FOR IMPROVEMENT OF MATERIALS CENTRAL MASS SPECTROMETER.
Final rept., 1 Mar 61-28 Feb 62 on Materials Analysis and Evaluation Techniques,
by George D. Perkins and David H. Pollock.
June 62, 19p. incl. illus.
(Contract AF 33(616)7932, Proj. 7360)
(ASD TDR 62-275) Unclassified report

DESCRIPTORS: *Mass spectrometers, *Mass spectroscopy, Photographic analysis, Solids, Ion beams, Ionization, Sparks, Photographic emulsions, Sensitivity, Spark shadowgraph photography, Atomic structure, Molecular structure.

Efforts were concerned with improvements for a

mass spectrograph to permit accurate analysis of solid materials. Methods were discussed for improving spark yield, working sensitivity, ease of operation and analytical accuracy. Improvement in average ion yield and in ease of spark manipulation was achieved. Photographic emulsion variations were a serious limitation to sensitivity and to analysis accuracy but with a satisfactory plate, sensitivity of approximately 1 in 10 to the 9th power was obtained with exposure durations of about 1 1/2 hours. The flexibility of Knudsen Cell operation was greatly enhanced by a complete redesign of the supporting structure. (Author)

AD-283 010 Div. 25, 15
(TISTP/WH) OTS price $4.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
ON THE SOLUTION OF A NON-LINEAR PARABOLIC EQUATION WITH A FLOATING BOUNDARY ARISING IN A PROBLEM OF PLASTIC IMPACT OF A BEAM,
by Thomas C. T. Ting. May 62, 43p. incl. illus. table, 11 refs. (Technical rept. no. 78; C11-78)
(Contract Nonr-56210, Proj. NR-064-406)
Unclassified report

DESCRIPTORS: *Loading, *Impact shock, *Stresses, *Cantilever beams, Elasticity, Plasticity, Non-linear differential equations.

The deformation of a cantilever beam with strain rate sensitivity subjected to impact loading at its base is studied by an approximate method in which the inertia forces in the plastic region are neglected. If these forces are taken into account, the equation of motion in the plastic region is a fourth order non-linear parabolic differential equation with a floating boundary, i.e. one whose position varies with time and must be found as part of the solution. A numerical solution of this equation is presented. The results show that the bending moment in the plastic region varies nearly linearly. This result implies that the shear force is nearly constant in the plastic region, and hence that the inertia forces in the plastic region are small in comparison with the shear force in the same region. (Author)

AD-283 015 Div. 25
(TISTW/RD) OTS price $2.60

Coordinated Science Lab., U. of Illinois, Urbana.
ENERGY DISTRIBUTION OF ELECTRONS EJECTED FROM TUNGSTEN BY He+,
by F. M. Propst. July 62, 19p. incl. illus. 14 refs. (Rept. no. R-147)
(Contract DA 36-039-sc-85122)
Unclassified report

DESCRIPTORS: *Secondary emission, *Field emission, Helium, Energy, Ions, Electron transitions, Statistical distributions, Tungsten.

The results of a calculation of the energy distribution of electrons ejected from tungsten by low energy He(+) are presented. The calculation is based on a mechanistic model of the process in which the ejected electrons are divided into two groups: (1) the electrons excited in the primary process that can escape directly; and, (2) the electrons that escape because of interactions between the primary electrons and those of the band structure of the solid. Secondary electron data are used to predict the portion resulting from this second mechanism. (Author)

AD-283 019 Div. 25
(TISTP/WH) OTS price $1.60

Diamond Ordnance Fuze Labs., Washington, D. C.
RELATIONSHIP BETWEEN SPECULAR REFLECTION PATTERNS AND REFLECTING BODY SHAPE,
by Walter J. Brinks. 3 Aug 62, 22p. incl. illus.
(Rept. no. TR-1040)
(Proj. 24700)
Unclassified report

DESCRIPTORS: *Electromagnetic wave reflections, *Bodies of revolution, *Optical images, Target recognition.

When electromagnetic radiation is specularly reflected from a body and then allowed to fall upon a surface, it produces upon this surface, curves called traces. A method is presented to connect the form of the traces with the shape of the reflecting surface. It is also pointed out that the time succession of the traces is characteristic of the motion of the body. (Author)

AD-283 026 Div. 25
(TISTP/GRW) OTS price $1.60

Institute of Aerophysics, U. of Toronto (Canada).
RESEARCH IN MAGNETOGASDYNAMICS.
Final technical rept.,
by J. H. deLeeuw. 28 Mar 62, 11p.
(Contract AF 49(638)823)
Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, Gas ionization, Shock waves, Plasma physics, Electromagnetic fields.

AD-283 036 Div. 25
(TISTM/CRJ) OTS price $1.60

Lear, Inc., Santa Monica, Calif.
SEMICONDUCTOR THIN FILMS.
Quarterly rept. no. 3, 1 May-31 July 62,
by J. M. Axelrod. 31 July 62, 12p. illus.
(Contract AF 33(657)7623)
Unclassified report

DESCRIPTORS: *Semiconductors, *Thin films, Gallium compounds, Arsenides, Electron microscopy, Calcium compounds, Fluorides, Silicon, Growth, Single crystals, Cadmium compounds, Diodes, Intermetallic compounds.

Crystalline deposits were obtained consistently since the installation of a gravity operated lever for holding the substrates in contact with the substrate heater. Temperatures of substrates as measured by the inserted thermocouple were 60 - 90 degrees below the measured temperature of the substrate heater. GaAs films were peeled by the same method as were Ge films. Films were peeled by thermal shock onto filled epoxy resin but were not isolated from the resin. The possibility was explored of peeling a double layer consisting of metal on GaAs off onto plastic. N type GaAs was deposited by evaporation of a mixture of GaAs and selenium powders. An 0.02 ohm-cm n type film gave point contact diode action with a rectification ratio of 7.5 (0.6 ma/0.08 ma) at one volt. Large (1000 square mil) and small (4 square mil) areas of n type GaAs were deposited onto a Mg doped p type film on CaF2 and overlaid with slightly smaller areas of gold. Measurement between the gold and the p CaAs showed pure resistance for both large and small areas. Direct contact to the n GaAs showed diode (point contact) behavior.

# Division 25 - PHYSICS

AD-283 041 Div. 25
(TISTP/FR) OTS price $4.60

Aerojet-General Corp., Azusa, Calif.
THE USE OF LANGMUIR PROBES TO STUDY ION-ELECTRON RECOMBINATION,
by C. B. Kretschmer and H. L. Petersen. July 62, 36p. incl. illus. table, 22 refs. (Rept. no. AN-664)
(Contract AF 49(638)540, Proj. 9750)
Unclassified report

DESCRIPTORS: *Recombination reactions, *Ionization gages, Discharge tubes, Ions, Electrons, Plasma physics.

AD-283 066 Div. 25
(TISTP/JW) OTS price $1.60

Ohio State U. Research Foundation, Columbus.
EXCHANGE INTERACTION BETWEEN CHROMIUM IONS IN RUBY CRYSTALS,
by F. J. Milford, M. Kreitman, and J. G. Daunt. Aug 62, 13p. incl. illus. 7 refs. (Technical rept. no. 7)
(Contract Nóonr-49520, Proj. NR018-412; In cooperation with Battelle Memorial Inst., Columbus, Ohio.)
Unclassified report

DESCRIPTORS: *Exchange reactions, *Ruby, *Crystals, Ferromagnetism, Measurement, Chromium, Ions, Temperature, Spin, Magnetic properties.

AD-283 078 Div. 25
(TISTP/JW) OTS price $6.60

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
INJECTION OF A TENUOUS PLASMA INTO A CUSPED MAGNETIC FIELD,
by Claude S. Leffel, Jr. June 62, 57p. incl. illus. 12 refs. (Rept. no. CM-1023)
(Contract NOw 62-62-0604-c)
Unclassified report

DESCRIPTORS: *Plasma physics, *Electrons, Density, Particles, Measurement, Temperature, Ionization, Magnetic fields.

A Penning discharge (PIG) plasma source was used to inject a tenuous plasma into a cusped magnetic field. Evidence is presented which indicates that the source ejects a plasma beam which is essentially neutral and that the plasma beam can be successfully injected into cusped fields as high as 20,000 gauss. Probe measurements, made within the cusped field, yield plasma densities of the order of 10 to ninth power cm to the minus one-third power and electron temperatures of 20 to 30 ev. Attempts to measure plasma confinement times were inconclusive. The relationship of single-particle containment theory to this experiment is discussed. (Author)

AD-283 089 Div. 25
(TISTP/JW) OTS price $2.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
A KINEMATIC TREATMENT OF THE APPROACH TO EQUILIBRIUM IN A PLASMA,
by S. Ichimaru. June 62, 18p. incl. illus. table, 8 refs. (Scientific rept. no. 2)
(Contract AF 19(604)7473)
(AFCRL 62-562) Unclassified report

DESCRIPTORS: *Plasma oscillations, *Wave analysis, Electron bombardment, Particles, Density, Excitation, Functions, Ionization, Equilibrators.

A set of kinematic equations are obtained from the Pines-Schrieffer formulation to describe the approach to equilibrium of electrons and collective oscillations in a plasma. The kinematic equations contain the conservation laws which the Pines-Schrieffer formulation satisfies. The kinematic formulation is applied to an analysis of the time-dependent behavior of a plasma which is unstable against a growing plasma wave. A close comparison is made with the analysis carried out by Drummond and Pines for a similar situation; the equivalence of the two treatments in a number of fundamental predictions is established. The role played by the spontaneous emission of plasma waves is also discussed. (Author)

AD-283 095 Div. 25, 17
(TISTM/EJh) OTS price $2.60

Illinois U., Urbana.
SOME SIMPLE SITUATIONS DESCRIBED BY THE EQUATIONS GOVERNING THE KINETICS OF POINT DEFECTS,
by J. S. Koehler, M. de Jong, and F. Seitz. Aug 62, 21p. incl. illus. tables, 11 refs. (Technical rept. no. 5)
(Contract Nonr-183426)
Unclassified report

DESCRIPTORS: *Metals, *Lattices, Kinetic theory, Crystal structure, Heat treatment, Differential equations, Gold, Cooling, High temperature research.

The differential equations which govern the kinetics of single-, di-, tri-, and one configuration of tetra-vacancies are presented. The equations are very complex and cannot be integrated in a simple way. Three examples are discussed where matters are deliberately arranged so that only a few processes occur simultaneously, and that the equations become relatively simple: (1) the production of divacancies during quenching; (2) the condition for the formation of vacancy clusters; (3) the achievement of the equilibrium ratio of singles and divacancies during annealing. (Author)

AD-283 120 Div. 25, 15
(TISTP/WH) OTS price $2.60

Oregon State U., Corvallis.
THE COMPLIANCE MATRIX AND MOLECULAR VIBRATIONS,
by J. C. Decius. 15 Aug 62, 23p. incl. tables, 22 refs. (Technical rept. no. 5)
(Contract Nonr-128603, Proj. NR 015-405)
Unclassified report

DESCRIPTORS: *Molecular rotation, *Molecular spectroscopy, *Matrix algebra.

It is shown that treatment of the molecular vibration problem in the form $\left| F_n^{-1} G_n^{-1} - \lambda^{-1} E_n \right| = 0$ has certain advantages when the data from vibrational spectroscopy are to be combined with information from mean amplitudes of vibration or centrifugal distortion toward the end of determining a complete quadratic potential function. The matrix $F_n^{-1} = C_n$ is a compliance matrix; its elements presumably have as much physical significance as those of $F_n$. Some new isotopic sum

rules are formulated, appropriate to the compliance scheme, but they are not nearly so general as those involving the λ's. Linear molecules are discussed and some numerical examples are given for non-linear $XY_2$ and $XY_4$. (Author)

# 26. PRODUCTION AND MANAGEMENT

AD-281 706 Div. 26
(TISTB/AW) OTS price $18.50

Aerospace Corp., Los Angeles, Calif.
CONTRACTUAL REQUIREMENTS RECORDING, ANALYSIS, AND MANAGEMENT. VOLUME I. MANUAL FOR BUYING ACTIVITIES.
June 62, 1v. incl. illus. (Rept. no. TDR-69(2408)TR-3, vol. 1)
(Contract AF 04(695)69)
(DCAS TDR 62-102, vol. 1)
Unclassified report

DESCRIPTORS: *Handbooks, *Air force procurement, Management engineering, Research program administration, Standardization, Control, Analysis, Air force operations, Air force research, Air force communications.

The Manual of Buying Activities, Volume I of Contractual Requirements Recording, Analysis, and Management System (CRAM), delineates the flow of control paperwork through affected Air Force Offices in the procurement of research and development (R&D) goods and/or services from and/or by private contractors. An automated, procurement activity, management control system, CRAM uses high-speed computers to maintain a master control file of data pertinent to the processing of contractual requirements and instruments from initiation to completion under a standardization pattern which is designed to provide Air Force buying offices and management with continually updated information as to procurement activity schedules and any detailed deviations thereto. This manual details the steps to be taken in each office. It is the operations manual for procurement activity control and reporting, and will be revised periodically by the addition, revision, and/or deletion of pages. (Author)

AD-281 740 Div. 26, 17, 14
(TISTM/REB) OTS price $13.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
WELDING OF NONFERROUS ALLOYS, RARE METALS, AND PLASTICS (SELECTED PARTS).
8 June 62, 197p. incl. tables, refs. (Trans. no. FTD-TT-62-123/1 of Svarka Tsvetnykh Splavov Redkikh Metallov i Plastmass, Vol. 101, Moskva, 1961, pp. 5-107, 186-216, 236-252)
Unclassified report

DESCRIPTORS: *Welding, *Alloys, *Plastics, *Metals, *Arc welding, *Electric welding, *Spot welding, Aluminum alloys, Molybdenum, Sheets, Electron beams, Ultrasonics, USSR.

Contents:
Vacuum electron-beam welding of metals
Fusion welding of technical molybdenum
Ultrasonic spot-welding of aluminum alloys
Use of ultrasound for welding metals used in the electronics industry
Elimination of buckling in thin-sheet welded structures by surface rolling
Development of technology and equipment for pulsed-power seam welding of bellows and heat exchangers
Influence of argon and Type 18-8 welding wire composition on the properties of seam metal
Welding equipment for automatic electric arc welding of curved joints

AD-281 830 Div. 26, 8
(TISTM/GEC) OTS price $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
WELDED ELECTRONICS CLEANING REQUIREMENTS,
by Dale R. Torgeson. June 62, 34p. incl. illus. tables (Rept. no. 3-26-62-1)
(Contract NOw 62-0363)
Unclassified report

DESCRIPTORS: *Electronic equipment, *Electric connectors, Spot welds, Mechanical properties, Abrasives, Fluorescence, Fluorescent dyes, Detection, Ultraviolet radiation, Oils, Greases, Nickel, Soldering alloys, Welding rods, Military requirements, Welded joints, Cleaning.

Cleanliness requirements designed to increase the reliability of lead welds for electronic components are described. Mechanical cleaning of component leads (i.e., Ni or Dumet wire and Ni ribbon) prior to welding resulted in welds superior to those attempted on uncleaned material. Mechanical cleaning was performed manually by means of a proprietary abrasive material consisting of Alundum deposited on nylon filaments. A method of determining lead material contamination by fluorescent analysis is described. The lead is exposed to an oil soluble fluorescent dye and is then examined in ultraviolet light. Intensity of fluorescence indicates the extent of oil and/or grease contamination. (Author)

AD-281 896 Div. 26, 14
(TISTM/GEC) OTS price $6.60

International Business Machines Corp., San Jose, Calif.
THE DYNAMIC BEHAVIOR OF PLANE, SELF-ACTING PIVOTED SLIDER BEARINGS OF INFINITE LENGTH, WITH AN INCOMPRESSIBLE LUBRICATING FILM.
Research rept.,
by W. Stuiver and R. S. McDuffie. 1 June 62, 59p. incl. illus. tables, 6 refs. (Rept. no. RJ-215)
(Contract Nonr-344803, Proj. NR 061-120)
Unclassified report

DESCRIPTORS: *Bearings, *Lubricants, Dynamics, Motion, Differential equations, Stability, Mathematical analysis, Theory, Films.

The dynamic behavior of plane, self-acting, pivoted slider bearings of infinite length is examined for the case of an incompressible lubricating film. The equations of motion for the slider are derived, with the lubricant force expressed exclusively in terms of the motion-coordinates and their derivatives, and the parameters that characterize the system. The equilibrium positions of the system are determined numerically and the stability of small motions in the neighborhood of these positions is examined. The nature of large motions is investigated by numerical integration of the equations of motion and the transient behavior of the system is shown and discussed for some specific cases. (Author)

# Division 26 - PRODUCTION AND MANAGEMENT

AD-281 943 Div. 26, 17, 1
(TISTM/GEC) OTS price $4.60

Northrop Corp., Hawthorne, Calif.
DEVELOPMENT OF IMPROVED METHODS, PROCESSES, AND TECHNIQUES FOR PRODUCING STEEL EXTRUSIONS.
Interim engineering rept. no. 12, 1 Apr-30 June 62,
by L. M. Christensen. June 62, 39p. incl. illus. tables (Rept. no. NOR 62-170)
(Contract AF 33(600)36713)
Unclassified report

DESCRIPTORS: *Steel, Production, Stainless steel, Tool steel, Drawing (Machine processing), Alloys, Airframes, Mechanical properties, Thickness, Manufacturing methods, Heat treatment, Extrusion.

Feasibility studies were made of warm drawing H-11 and PH15-7 Mo to the target configuration and tolerance of .040 ± .003 thickness. With very thin aerospace shapes, pointing becomes a critical problem. Push pointing should be considered as a means of obtaining the precision necessary to avoid breakage. H-11 is subject to a drawing defect which is apparently attributable to residual forces of gag straightening irrespective of temperature or draw speed. (Author)

AD-282 031 Div. 26, 8
(TISTP/GRW) OTS price $8.10

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
A HOMOGENEOUS NETWORK APPROACH TO SELF-STRUCTURING SYSTEMS,
by Richard J. Feldmann. June 62, 84p. incl. illus. 10 refs. (Rept. no. PIBMRI-1014-62)
(Contract AF 18(600)1505)
(AFOSR-2657) Unclassified report

DESCRIPTORS: *Operations research, *Microminiaturization (Electronics), Electrical networks, Feasibility studies, Delay circuits.

A homogeneous network approach to self-structuring systems is reported. The homogeneous delay networks provide a suitable physical realization of a system in which self-structuring could occur. The investigation of the general network aspects of self-structuring system is an attempt to formulate the inherent physical and structural limitations of any structured system. Only the network aspects of self-structuring systems are investigated. Future activity should be directed toward the application of the homogeneous delay networks to the investigation of the nature of self-organization. (Author)

AD-282 106 Div. 26
(TISTW/DLW) OTS price $2.60

RAND Corp., Santa Monica, Calif.
QUALITY CONTROL AND RELIABILITY FOR A TOTAL WEAPON SYSTEM,
by Eloise E. Bean and Wilbur A. Steger. Aug 62, 23p. incl. illus. tables, 6 refs. (Memo. RM-3130-PR)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: *Quality control, *Reliability, *Air force logistics, *Air force operations, Handling, Maintenance, Failure (Mechanics), Simulation, Military requirements, Costs, Guided missiles (Strategic), Strategic Air Command, Ground support equipment.

A possible approach is suggested for applying techniques to the established fields of reliability analysis and quality control. These techniques, including manned and all-computer simulation and tradeoff analysis between reliability, quality control, support, and the weapon end item, have not been explicitly considered and used by decision-makers responsible for reliability and quality control. Weapon system quality control actions are actions taken during the weapon planning and development cycle to help ensure to the commander a high degree of confidence in his over-all system. Some specific examples of how military or industrial decision-makers might be able to gain useful systems-oriented insight into quality control and reliability problems are presented. (Author)

AD-282 225 Div. 26
(TISTM/MS) OTS price $2.75

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
INVESTIGATION OF WELDING OF COMMERCIAL COLUMBIUM ALLOYS.
Final rept., 16 Jan 61-15 Jan 62 on Metallic Materials,
by J. M. Gerken and J. M. Faulkner. May 62, 138p. incl. illus. tables, 20 refs.
(Contract AF 33(616)7796, Proj. 7351)
(ASD TDR 62-292) Unclassified report

DESCRIPTORS: *Welding, *Niobium alloys, Mechanical properties, Microstructure, Heat treatment, Electric welding, Spot welding, Welded joints, Electron beams, Arc welding.

An investigation was made of the welding characteristics of three commercial columbium base alloys, FS82, D31, and F48. Tungsten inert gas, electron beam, spot, and flash butt welding methods were included in this investigation. The effect of the welding variables travel speed, shielding gas composition and purity, filler metal additions, preheat and post heat were studied. Thermal cycles were measured in the fusion zone and heat affected zone of TIG welds to help explain mechanical properties and microstructure on the basis of physical metallurgy of each alloy. The effect of welding on all alloys investigated was to increase the ductile to brittle transition temperature. This temperature was increased 200 F for FS82, 800 F for D31, and 500 to 800 F for F48 over that of the as-received wrought sheet. Of several post heat treatments investigated those most beneficial in lowering the transition temperature of welds were; 2000 F for 4 hours for FS82, 2100 F for 24 hours for D31, and 2500 F for 4 hours for F48. The electron beam welding process consistently produced more ductile welds than the TIG process. (Author)

AD-282 250 Div. 26, 17, 1, 12
(TISTM/AW) OTS price $6.60

Westinghouse Electric Corp., Blairsville, Pa.
HIGH ENERGY RATE EXTRUSION.
Interim technical progress rept. no. 7 on Phase 2, 1 Apr-31 July 62,
by J. M. Rippel. July 62, 56p. incl. illus. tables, 5 refs.
(Contract AF 33(600)41948)
(ASD TR 7-882, vol. 7)
Unclassified report

DESCRIPTORS: *Extrusion, *Titanium alloys, *Steel, *Aluminum alloys, Instrumentation, Dies, Design, Tools, Machining, Metals, Friction, Machine tools, Titanium, Materials, Selection, Airframes, Guided missiles, Spaceships, Manufacturing methods, Aluminum, Vanadium alloys.

Ten foot extrusions of Ti-6Al-4V were made. Eight feet of steel and twelve feet of aluminum were also made. Extrusions were of the Tee configuration, 2 inch by 1 inch by .050 inches thick. Surface finish is good, 100 RMS and tolerances of ± .005 inches were maintained. Some of the effects of die entry angle on the high energy rate extrusion process were determined. Details of this investigation are presented. A description of the extrusions made and the braking devices is also given. (Author)

AD-282 282 Div. 26, 17, 14
(TISTM/AW) OTS price $2.75

Metcut Research Associates, Cincinnati, Ohio.
MACHINING OF REFRACTORY MATERIALS.
Technical engineering rept. on Phase 2, 1 May-31 July 62,
by N. Zlatin, M. Field and J. Gould. Aug 62, 118p. incl. illus. tables.
(Contract AF 33(600)42349)
(ASD TR 7-532a, vol. 7)
Unclassified report

DESCRIPTORS: *Machining, *Refractory materials, *Heat resistant alloys, Tungsten, Tungsten alloys, Niobium alloys, Casting, Forging, Sintering, Phenolic resins, Zirconium compounds, Oxides, Aluminum compounds, Milling machines, Grinding wheels, Drills, Reamers, Tools, Temperature, Carbide tools, Alloys, Taps, Machine tools, Cutting tools, Molybdenum alloys, Tantalum alloys, Titanium alloys, Friction, Steel.

Machining studies were performed on pressed and sintered, forged and resintered, and arc cast unalloyed tungsten; D-31 columbium, 90Ta-10W alloy; silica reinforced phenolic resin; solid zirconium oxide; and zirconium and aluminum oxide coatings. The investigation consisted of face milling, end milling, drilling and tapping studies on tungsten and D-31 columbium; turning, face milling, drilling and tapping on silica reinforced phenolic resin; grinding of solid and flame sprayed zirconium and aluminum oxide coatings; and turning, face milling, end milling, drilling, reaming, tapping and grinding on the 90Ta-10W alloy. (Author)

AD-282 333 Div. 26, 15
(TISTP/GRW) OTS price $3.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
APPLICATION OF PONTRYAGIN'S MAXIMUM PRINCIPLE: LINEAR CONTROL SYSTEMS,
by Giancarlo L. Collina and Peter Dorato. June 62, 33p. incl. illus. 12 refs. (Research rept. no. PIBMRI-1015-62)
(Contract AF 18(603)105)
(AFOSR-2656) Unclassified report

DESCRIPTORS: *Control systems, *Linear systems, Algebraic topology, Functional analysis, Differential equations, Linear programming.

The problem of linear, continuous-time, deterministic optimal, control systems is discussed. In particular it is shown, via Pontryagin's maximum principle, that linear optimal control systems always result from the combination of (1) a linear plant; (2) integral quadratic performance criterion; and (3) no constraints on the plant input. The controller synthesis is outlined in the general time-varying case and various illustrative examples are included. A comparison of the maximum principle approach with dynamic programming and the classical calculus of variations is also included. Both driven and undriven control systems are considered. For the case where the time-interval of optimality is infinite, the stability of the optimal system is investigated. It is shown that stability is assured whenever the integral of the performance criterion is positive definite. (Author)

AD-282 350 Div. 26
(TISTB/MS) OTS price $5.60

Aerospace Corp., Los Angeles, Calif.
THE IMPS SYSTEM, INTEGRATED MASTER PROGRAMMING AND SCHEDULING,
by Thomas H. Tripp. 6 July 62, 55p. incl. illus. (Rept. no. TDR 69(2109)TN-2)
(Contract AF 04(695)69)
(DCAS TDR 62-131) Unclassified report

DESCRIPTORS: *Management engineering, *Scheduling, *Programming, Control, Air force operations.

A highly significant new management technique for planning, implementing, directing, monitoring, and controlling system programs is discussed. The Integrated Master Programming and Scheduling (IMPS) System is designed as a refinement of the Air Force's Systems Program Management technique with extensive EAM and computer applications. The IMPS System, operating with marked success in the development of a current space project, employs the basic elements of milestone event programming, allocation and delivery scheduling, and management controls of money, manpower and materiel. It integrates these interdependent elements into a realistic planning pattern based on a common time factor. (Author)

AD-282 374 Div. 26
(TISTM/EJH) OTS price $3.60

Mechanical Technology, Inc., Latham, N. Y.
COMPARISON BETWEEN THEORIES AND EXPERIMENTS FOR THE THRESHOLD OF INSTABILITY OF RIGID JOURNAL BEARINGS,
by C. H. T. Pan and B. Sternlicht. 3 Aug 62, 27p. incl. illus. tables, 15 refs. (Rept. no. MTI-62TR13)
(Contract Nonr-3730(00), Proj. NR 061-131)
Unclassified report

DESCRIPTORS: *Journal bearings, *Gas bearings, Bearings, Stability, Mathematical analysis, Design, Loading.

The threshold of Half Frequency Whirl for rigid rotor in self-acting plain cylindrical journal bearings was analyzed by several methods and the results were compared. The correlation between the various approaches appears to be good. The simplest method of analysis is therefore, used for comparison with experimental data. Experimental results showing the effect of bearing length and bearing load are compared with theory. The influence of bearing length on the threshold speed follows similarly as the calculated results. However, the experimental threshold speeds are always a little higher. In comparing the effect of bearing load it is seen that the calculated threshold speed is consistently somewhat overpessimistic, but the influence of rotor inclination is in very good agreement with experiment. The methods presented can be readily used in design to insure stable operation with plain cylindrical journal bearings. (Author)

# Division 26 - PRODUCTION AND MANAGEMENT

AD-282 447 Div. 26
(TISTP/GRW) OTS price $3.60

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
AN INVENTORY PRICING PROBLEM,
by W. M. Kincaid and D. A. Darling. July 62, 36p. (Rept. no. 04597-2-T)
(Contract Nonr-122441, Proj. NR 042-227)
Unclassified report

DESCRIPTORS: *Operations research, *Costs, *Scheduling, Statistical analysis, Supplies.

The optimum behavior of a person who is forced to make a decision, or a set of decisions, before a specified deadline is analyzed. The problem considered is one of a merchant selling goods to the public walking past his store. (Author)

AD-282 449 Div. 26, 32
(TISTP/TL) OTS price $1.60

Carnegie Inst. of Tech. Graduate School of Industrial Administration, Pittsburgh, Pa.
MATHEMATICAL BASIS OF THE CRITICAL PATH METHOD,
by F. K. Levy, G. L. Thompson, and J. D. Wiest. 30 May 62, 16p. 6 refs. (Research memo. no. 86)
(Sponsored by the Office of Naval Research and the Bureau of Ships)
Unclassified report

DESCRIPTORS: *Management engineering, *Industrial production, *Scheduling, *Human engineering, *Mathematical prediction, Probability, Operations research, Cost, Analysis.

The critical path method for planning projects, has recently found widespread application in industry. The formal mathematical properties of the method can be approached from several points of view (1, 2, 3, 5). The purpose of this paper is to study it from the point of view of mathematical relations. It is interesting that the immediate precedence relation that is set up among jobs in a project should ideally be irreflexive and k-intransitive, in contrast to the properties usually possessed by mathematical relations (reflexivity and transitivity). This points up the need for more extensive study of the formal properties of mathematical relations by persons interested in management science. (Author)

AD-282 450 Div. 26, 32
(TISTP/TL) OTS price $2.60

Carnegie Inst. of Tech. Graduate School of Industrial Administration, Pittsburgh, Pa.
CRITICAL PATH METHOD - A NEW TOOL FOR MANAGEMENT,
by F. K. Levy, G. L. Thompson, and J. D. Wiest. 25 May 62, 25p. incl. illus. (Research memo. no. 97)
(Sponsored by the Office of Naval Research and Bureau of Ships)
Unclassified report

DESCRIPTORS: *Management engineering, *Cost, *Mathematical prediction, *Probability, *Scheduling, Industrial production, Operations research, Human engineering, Analysis.

Recently added to the growing assortment of quantitative tools for business decision-making is the Critical Path Method, a powerful but basically simple technique for analyzing, planning, and scheduling large, complex projects. In essence, the tool provides a means of determining (1) which jobs or activities, of the many which comprise a project, are critical in their effect upon total project time, and (2) how best to schedule all jobs in the project in order to meet a target date at minimum cost. Widely diverse kinds of projects lend themselves to analysis by the Critical Path Method.

AD-282 453 Div. 26, 17
(TISTM/GEC) OTS price $5.00

Northrop Corp., Hawthorne, Calif.
PROGRAM FOR THE DEVELOPMENT OF EXTRUDED BERYLLIUM SHAPES.
Final technical engineering rept., 20 Apr 58-31 Dec 61,
by L. M. Christensen and R. R. Wells. June 62, 301p. incl. illus. tables (Rept. no. NOR-62-25)
(Contract AF 33(600)36931)
(ASD TR 62-7-644) Unclassified report

DESCRIPTORS: *Beryllium, Airframes, Structures, Manufacturing methods, Processing, Dies, Lubrication, Heat treatment, Metal forming presses, Thickness, Lubricants, Tensile properties, Mechanical properties, Elasticity, Tests, Glass, Metallurgy, Extrusion.

Aircraft and aerospace structural shapes of unalloyed Be were extruded to a wall thickness of 0.060 in. ± 0.001 in. Pilot production of five 20-ft long extrusions demonstrated good dimensional integrity and surface quality for structural channels 1.50 in. wide and 1.00 in. high. An investigation was made of lubrication, die materials, heating, die design and the effect of variable press speeds. A prime contributing factor to the success of the project was the change of technical approach from the glass lubrication system to a newly developed refinement of the canned or clad extrusion technique, utilizing a composite lubricant system. It was determined that composite lubrication of metallic and liquid (nonglass) lubricants is better adapted to utilization with Be than is bare glass lubricated extruding. Flat faced dies were best for the glass lubricant approach while a conical entrance was best for composite lubricants. Fillet radii as small as 0.03 in. radius can be produced in Be. The tensile ultimate strength and elongation of the 0.06 thick extrusion increases from a low at the front end of the extrusion up to values at the back similar to those found for other thickness extrusions. Tensile properties were quite uniform in the 0.120 in. and 0.080 in. thickness extrusions. (Author)

AD-282 681 Div. 26, 14, 17, 27
(TISTW/RD) OTS price $4.60

Rocketdyne, Canoga Park, Calif.
MANDRELS FOR FILAMENT WINDING.
Interim technical engineering rept. no. 3, 9 Feb-9 May 62,
by I. Tubb. 9 May 62, 40p. incl. illus. tables.
(Contract AF 33(600)43594)
(ASD TR 7-880a, vol. 3)
Unclassified report

DESCRIPTORS: *Filament wound construction, Manufacturing methods, Aluminum, Sand, Rocket cases, Mechanical properties, Physical properties, Calcium compounds, Materials, Wire winding machines.

Laboratory tests were conducted on Paraplast 55 with aluminum fiber filler and Paraplast 55 (unfilled) to compare physical and mechanical properties between the filled and unfilled salt. Tests were also conducted on PVA-sand mandrel material. Data were accumulated on small-scale mandrels (2 feet in diameter and 3 feet long). Measurements were taken before winding and after

each winding operation: 2- by 3-feet mandrels from which data have been obtained are (1) sand-PVA, (2) Kerr DMM, (3) two types of mechanical breakout plasters (Hydrocal B-11 and Ultracal 30), (4) Bogart-Bullock's 1736 soluble plaster, and (5) a collapsible, segmented metal mandrel. (Author)

AD-282 809 Div. 26, 25
(TISTM/EJH) OTS price $3.60

Union Coll., Schenectady, N. Y.
THE PROBABILITY OF INTERMITTENT CONTACT OF EXTERNALLY PRESSURIZED GAS BEARINGS EXCITED BY STOCHASTICALLY DEFINED FORCING OF THE BEARING SUPPORTS,
by Joseph Modrey. Aug 62, 36p. incl. illus. 9 refs.
(Grant Nonr(G)-00028-62)
Unclassified report

DESCRIPTORS: *Gas bearings, *Journal bearings, Loading, Stresses, Pressure, Probability, Reliability, Vibration, Integral equations, Mathematical analysis.

Gas bearings, lacking protective boundary films, will be more susceptible (than oil bearings) to damage occasioned by the randomly extreme loadings which vehicles (ships, missiles, aircraft, ground vehicles) encounter in field operations. Since the loadings which a vehicle will sustain during its service life can only be defined in a probabilistic manner the eccentricity of the bearing journal must necessarily be stated in probabilistic language. The analytics necessary to express the reliability of gas bearings in terms of the probability of damage due to the random vibration of bearing supports encountered in a service environment are described. The case of a flexible rotor supported on externally pressurized gas bearings is specifically referred to. Both the linear and non-linear bearing stiffness examples are investigated. (Author)

AD-282 811 Div. 26,
(TISTM/GEC) OTS price $3.60

Watervliet Arsenal, N. Y.
UNIVERSAL DATA FOR RESISTANCE SPOT WELDING,
by Herbert Frankel, Keh-Chang Wu, and Richard E. Lewis. June 62, 34p. incl. illus. tables, 13 refs. (Technical rept. no. WVT-11-6211)
Unclassified report

DESCRIPTORS: *Spot welding, Resistance, Electric welding, Pressure, Welding, Direct current, Frequency converters, Electric currents, Temperature, Electric power production, Processing.

In order to transfer data concerning welding current, time, pressure from single phase resistance welders to polyphase spot welders, various approaches are considered. The only method that shows promise is the calculation of one number for a particular metal that considers material thickness, electrode force, welding current, and welding time for a single phase welder. Multiplication of this single number by a factor yields another number which represents the settings on the dc welder or the frequency converter welder. The result is only approximate and should result in a reduction in the amount of experimentation required to determine the parameters for the polyphase welders rather than its complete elimination. (Author)

AD-282 813 Div. 26, 17
(TISTM/GEC) OTS price $5.60

Wah Chang Corp., Albany, Oreg.
TUNGSTEN EXTRUSION DEVELOPMENT PROGRAM.
Interim technical engineering rept., 20 Apr-20 June 62,
by A. E. Riesen. 20 June 62, 46p. incl. illus. tables, 2 refs.
(Contract AF 33(600)42395, Proj. 7-793)
(ASD Interim rept. no. 7-793, vol. 4)
Unclassified report

DESCRIPTORS: *Tungsten alloys, Processing, Molybdenum alloys, Dies, Heat treatment, Hardening, Glass, Lubricants, Refractory coatings, Zirconium compounds, Dioxides, Flame spraying, Bonding, Microstructure, Extrusion.

One additional solid round extrusion of as-cast W-3Mo alloy was partially accomplished from 3200 F at a reduction ratio of about 16.4:1 and only 88% of liner capacity. Billet temperature of about 3200 F was established as the starting temperature for the extrusion of 'T' shapes at a reduction ratio of about 17:1. 'T' shape extrusions of cast W-3Mo alloy were accomplished from 3100 to 3200 F at a reduction ratio of about 18:1. These extrusions were made to study die glass composition and associated hardening point. Good dimensional run-out and light glass rub-in resulted from the use of soft rather than hard die glass. Good extrusion results were obtained with an extrusion die having a basic included entry angle of 130 degrees, 1/4-in. constant land, minimum entry radius of 3/16-in. to a maximum entry radius of 5/16-in., a surface hardness of Rockwell C 48 to 50 and protected by 0.030 to 0.040-in. thick coating of ZrO2 applied by the oxyacetylene flame-spray process with solid-rod feed. Die surfaces roughened to at least 500 rms appeared essential for sufficient bond strength with the ZrO2 coating. (Author)

AD-282 914 Div. 26
(TISTW/DLW) OTS price $4.60

Burndy Corp., Norwalk, Conn.
RESEARCH DESIGN AND DEVELOPMENT TOOL AND SPLICE FOR TELEPHONE CABLE WF-16 ( ) /.
Quarterly rept. no. 4, 15 Feb-15 July 62,
by William L. Colwell. 15 July 62, 1v. incl. illus.
(Contract DA 36-039-sc-87226)
Unclassified report

DESCRIPTORS: *Telephone cables, *Splicing tools, Insulating materials, Electric connectors, Moistureproofing, Crimping tools, Design, Tests, Maintenance equipment.

The MR8-77 HYTOOL and P2S22 insulated splice were developed to splice Wf-16 telephone cables. The P2S22 insulated splice consists of a nylon (Zytel 101) insulating sleeve; two OFHC, fully annealed, tin plated copper inner ferrules; and two outer, fully annealed OFHC, tin plated copper sleeves. The complete splice assembly is approximately 1 and 1/4 inches long, 1/4 inch wide, 1/8 inch thick and accommodates two parallel pairs of WF16( )/(U) type cable. The MR8-77 HYTOOL consists of a body made of a heat treated aluminum alloy, steel handle, internal ratchet mechanism and alloy steel crimp die components. The completely assembled tool weighs approximately 1 and 3/4 pounds and measures approximately 10 1/2 inches long and 3 inches wide. A hand force of approximately 60 pounds (on the tool handles) is required to bottom the dies and release the ratchet. (Author)

# Division 27 - PROPULSION SYSTEMS

AD-282 920 Div. 26, 17, 4, 1
(TISTM/ODN) OTS price $8.60

Douglas Aircraft Co., Inc., Long Beach, Calif.
CHEMICAL COMPOUNDS FOR METAL SHAPING.
Interim technical progress rept., 1 Jan-30 June 62,
by J. R. Cady, J. L. Jamieson and others.
July 62, 95p. incl. illus. tables, 11 refs.
(Contract AF 33(600)43027, Proj. 7-648; In cooperation with University of Southern California, Los Angeles)
(ASD TR 7-648, vol. 2) Unclassified report

DESCRIPTORS: *Metals, *Gels, *Stainless steel, *Chemical milling, Materials, Solutions, Resins, Methanes, Carboxylic acids, Methyl radicals, Cellulose acetates, Acetates, Vinyl radicals, Honeycomb cores, Colloids, Solids, Processing, Mechanical properties, Chemicals, Surfaces, Porous materials, Iron compounds, Chlorides, Acids, Molding, Tests, Aircraft, Reagents, Chemical properties, Alloys, Metal plates.

Further development of gel systems has improved physical, chemical and mechanical properties. Milling metal plate stock is limited by the amount of chemical energy presently available in the gel. Stainless steel honeycomb was chemically contoured with good dimensional control. Porous solids carrying liquid etchants formed profile cuts, but tolerance and surface finish need improvement. Comparative tests with liquid and non-liquid etchants determined probable limits of performance. (Author)

AD-283 040 Div. 26
(TISTB/AW) OTS price $8.10

Aerospace Corp., El Segundo, Calif.
CONTRACT REQUIREMENT RECORDING, ANALYSIS AND MANAGEMENT. ORIENTATION AND PRESENTATION MATERIAL.
July 62, 1v. incl. illus. tables (Rept. no. TDR-169(3451)TR-1)
(Contract AF 04(695)69)
(DCAS TDR 62-150) Unclassified report

DESCRIPTORS: *Military procurement, *Management engineering, *Research program administration, Automation, Scheduling, Feasibility studies, Standardization, Air force operations, Analysis.

An automated procurement activity management information system, 'Contractual Requirements Recording, Analysis, and Management' (CRAM), was designed to improve the planning and control of procurement activities and to appreciably reduce the workload in the individual contracting offices. CRAM is designed for uniform application within all procurement areas of the Ballistic Systems and Space Systems Divisions. The application of the CRAM system to the operation of the procurement cycle as it pertains to specific kinds of contractual instruments is described. CRAM reporting features are defined as to purpose, content and use together with illustrations. (Author)

## 27. PROPULSION SYSTEMS

AD-281 710 Div. 27, 26
(TISTM/EJH) OTS price $2.60

Aerojet-General Corp., Sacramento, Calif.
SPINNING THIN-WALL SECOND-STAGE MINUTEMAN NOZZLE THROAT INSERTS OF UNALLOYED TUNGSTEN,
by F. L. Banta. 31 July 62, 18p. incl. illus. tables (Rept. no. 0162-01TN-12)
(Contract AF 33(600)36610)
(Technical note BSD-TDR-62-12)
Unclassified report

DESCRIPTORS: *Rocket motor nozzles, *Tungsten, *Hydroforming, Metal plates, Manufacturing methods, Production, Microstructure, Feasibility studies.

The feasibility of fabricating full-scale second-stage Minuteman nozzle throat inserts of unalloyed W by a combination of shear and conventional spinning was investigated. Replacing the present forged-and-machined nozzle throat insert with a spun thin-wall insert would significantly reduce nozzle weight. Thin wall (0.060-in.-thick) convergent-divergent nozzle throat inserts were successfully fabricated from 0.250-in.-thick unalloyed W plate by a combination of shear and conventional spinning. Tungsten plates were shear-spun into 60-degree-included-angle cones with a wall-thickness reduction of 50%. These cones were then spun to an included angle of 30 degrees; wall-thickness reduction was again 50%, for a total reduction of 75%. The 30-degree cones were conventionally spun to an 8-degree included angle and then to a convergent-divergent configuration conforming to the second-stage Minuteman nozzle throat-insert design. (Author)

AD-281 794 Div. 27, 14
(TISTM/TCG) OTS price $2.50

Armour Research Foundation, Chicago, Ill.
STUDY OF THE MECHANISM OF FAILURE OF ROCKET MATERIALS AND MATERIALS RESEARCH.
Final rept., 15 Mar 60-15 Dec 61 on Refractory Inorganic Non-Metallic Materials,
by Y. Baskin, D. C. Schell, and W. K. Sumida.
May 62, 102p. incl. illus. tables, 13 refs.
(Contract AF 33(616)7048, Proj. 7350)
(ASD TDR 62-314) Unclassified report

DESCRIPTORS: *Rocket motor nozzles, *Refractory materials, *Graphite, *Failure (Mechanics) Ceramic materials, Zirconium compounds, Carbides, Thorium compounds, Oxides, Impregnation, Tungsten, Tantalum, Fibers, Furfuryl alcohols, Reinforcing materials, Composite materials, Coatings, Erosion, Combustion, Oxidation, Deterioration, Ablation, Thermal stresses, Plasma jets, Processing, Materials, Preparation.

Rocket failure mechanisms in conjunction with the development of nozzle materials for solid propellant motors is discussed. Testing graphite in an oxy-acetylene torch and the effects of purity, density, orientation, and microstructure on erosion-resistance were evaluated. Erosion decreased with greater purity. New graphite materials were developed and evaluated including hot pressed compositions and impregnated bodies. Suitability of ZrC as a nozzle material was evaluated. Incorporation of Ta and W fibers in ZrC results in considerable improvement in resistance to thermal spalling although not sufficient to prevent cracking. Thoria-base bodies reinforced with W fibers were studied. Ten promising materials were fabricated into rocket nozzles and tested in static motor stands. Erosion performance is presented along with analysis of failure mechanisms.

AD-281 817 Div. 27, 12, 25
(TISTA/VGW) OTS price $1.60

Aerospace Information Div., Washington, D. C.
CZECHOSLOVAK IDEAS ON AEROSPACE PROPULSION.
12 July 62, 13p. incl. illus. (AID rept. no. 62-204)

Unclassified report

DESCRIPTORS: *Rocket propulsion, Electric propulsion, Nuclear propulsion, Liquid rocket propellants, Solid rocket propellants, Rocket motor nozzles, Combustion, Exhaust gases, Deflection, Czechoslovakia, Atoms, Solar energy.

Annotated drawings are presented from a popular booklet which describes Czechoslovak aerospace propulsion ideas. The scope of the book is illustrated by the reproduced drawings. The following two ideas are of special interest: (1) Metastable atoms have a large energy excess compared to stable atoms. This excess energy might be used to drive rockets. Metastable fuels can be stored under stable conditions at extremely low temperatures. (2) Solar radiation dissociates and ionizes the individual gases that make up the high strata of the atmosphere into free radicals and ions. When these revert to the initial states, they liberate large amounts of energy. The accumulated energy of free radicals and ions might be used in aircraft propulsion at high altitudes. Such a drive might consist of a ramjet engine with an electrically charged catalyzer-screen set designed to utilize the recombination of oxygen and other types of ions, converting the energy thus liberated into thrust. Output of such an engine would depend on the composition of the upper atmosphere, the aerodynamic engine cycle, and the chemical kinetics of ion recombination. (Author)

AD-281 848 Div. 27
(TISTA/SEB) OTS price $21.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
AIR COOLING OF GAS TURBINE ROTORS (Vozdushnoye Okhlazdeniye Rotorov Gazovykh Turbin),
by I. T. Shvets and E. P. Dyban. 18 July 62, 371p. incl. illus. tables, 140 refs. (Trans. no. MCL-1406/1 of Izdatel'stvo Kievskogo Universiteta Kiev, 1-351, 1959)

Unclassified report

DESCRIPTORS: *Gas turbine rotors, *Handbooks, Turbojet inlets, Gas flow, Temperature, Effectiveness, Materials, Elasticity, Stresses, Tensile properties, Alloys, Steels, Heat transfer, Steam turbines, Duct inlets, Heat exchangers, Cooling, Surfaces, Friction, Guide vanes, Design, Aerodynamics, Turbulence, Translations, USSR, Air cooled, Gas turbines.

Contents include: Effect of inlet temperature of the working fluid on the efficiency of the gas turbine plants; Gas turbine construction materials; Heat transfer concepts; Investigation methods of heat exchange in elements of gas and steam turbines; Methods of cooling gas turbine rotor parts; Heat exchange between gas and turbine parts; Heat exchange in cooling channels of gas turbine rotors; Heat exchange on lateral surfaces of turbine rotors; Heat transfer in working blade shank zone; Contact heat exchange in turbine parts; Calculating temperature fields of cooled turbine discs under steady-state heat transfer; Temperature fields in working and guide blades; Aerodynamic design of air-cooled gas turbine rotors; and Thermal calculation of air-cooled gas turbine rotors.

AD-282 235 Div. 27, 17
(TISTM/ODN) OTS price $1.60

Ingersoll Kalamazoo Div., Borg-Warner Corp., Mich.
THE EFFECT OF SURFACE DECARBURIZATION ON PROTOTYPE MISSILE CASES.
Quarterly rept. no. 1, 1 Jan-30 June 62, by E. S. Mills and D. P. Thomason. 20 July 62, 20p. incl. illus. tables.
(Contract NOrd-15719)

Unclassified report

DESCRIPTORS: *Carbon, *Steel, *Rocket cases, Welded joints, Joints, Adhesives, Shear stresses, Disposal, Bonded joints, Bonding, Manufacturing methods, Pipes, Pressure, Surfaces, Tensile properties.

The materials used in the program are 2 steels, MBMC #1 and super tricent. Drawings of the prototype cases as well as the bonded uniaxial and biaxial stress specimens are shown. Test results are presented for the first group of tensile specimens having a bonded lap joint. Average joint strength for the group was 15,860 lb per peripheral inch (width), somewhat above the target joint strength of 15,000 established for the prototype bonded end ring case. A curve is drawn showing the hydrotest pressures for various size missile cases a bonded joint of this strength will withstand. (Author)

AD-282 463 Div. 27, 12
(TISTA/GEC) OTS price $8.60

North American Aviation, Inc., Downey, Calif.
ION AND ELECTRIC PROPULSION SYSTEMS FOR SPACE FLIGHT: A LITERATURE SURVEY.
1 Mar 62, 91p. 335 refs. (Rept. no. SID 62-127)

Unclassified report

DESCRIPTORS: *Ion rockets, *Electric propulsion, *Bibliography, Space flight, Rocket propulsion.

This report surveys the literature from its beginning through December 1961 on Ion & Electric Propulsion Systems. (Author)

AD-282 617 Div. 27
(TISTA/GEC) OTS price $2.60

4750th Test Squadron (Tactics and Application Engineering) Tyndall Air Force Base, Fla.
J-33 TURBINE WHEEL AREA TEMPERATURE INVESTIGATION,
Final rept.,
by David W. Tobey. 15 Aug 58, 25p. incl. illus.
(Proj. ADC/73AD/J33-1)

Unclassified report

DESCRIPTORS: *Turbine wheels, *Turbojet engines, Temperature, Measurement, Air force operations, Jet training planes, Towed bodies, Diffusers, Flight paths, Aerial targets, Flight testing.

Turbine wheel area temperature data was collected on two specially instrumented J33-A-35 engines operated at various power settings and altitudes while towing targets on a target tow profile mission with a T-33 aircraft. High temperature conditions in the turbine section were found to be primarily a function of altitude, power setting and air speed. Towing targets affect temperature only as altitude and air speed are affected. Removal of the outer rim from the turbine diffuser and the addition of two louvers to the fuselage aft section will help alleviate high temperature conditions in the turbine section of J33-A-35 engines. (Author)

# Division 27 - PROPULSION SYSTEMS

AD-282 574 Div. 27, 30
(TISTW/RD) OTS price $2.60

Naval Ordnance Test Station, China Lake, Calif.
DESIGN AND EVALUATION OF A FLEXIBLE, THRUST-MEASURING TEST-STAND MOUNT,
by Ralph D. O'Dell, William F. Thorn, and Robert J. Grasley. July 62, 24p. incl. illus. tables (NOTS TP 2899)
(NAVWEPS rept. no. 7899) Unclassified report

DESCRIPTORS: *Rocket motors, Thrust, Measurement, Tests, Flexible couplings, Strain gages, Test equipment, Test facilities.

The design and evaluation of the flexure-cell, a flanged column with strain gages attached, are discussed. Tables, graphs, and equations show the characteristics of the flexure-cell. Results show that this flexible test-stand mount is cheap, hence expendable, and capable of thrust measurements of fairly high accuracy. (Author)

AD-282 730 Div. 27, 14
(TISTM/MS) OTS price $8.10

Atlantic Research Corp., Alexandria, Va.
DEVELOPMENT OF FLEXIBLE POLYMERS AS THERMAL INSULATION IN SOLID-PROPELLANT ROCKET MOTORS.
Annual summary rept. no. 2, 30 June 61-30 June 62,
by N. Vasileff, T. Walton, and J. Duffy.
31 July 62, 1v. incl. illus. tables.
(Contract DA 36-034-ORD-3325-RD)
Unclassified report

DESCRIPTORS: *Thermal insulation, *Combustion chamber liners, *Rocket motors, *Insulating materials, Resins, Epoxy resins, Polymers, Furan, Esters, Amines, Urethanes, Epoxides, Amides, Physical properties, Mechanical properties, Combustion, Phenolic resins, Heat resistant polymers, Solid rocket propellants.

The flexibilization of epoxy, melamine, phenolic, urethane, and furan resins for use as thermal insulation binders in end-burning, solid-propellant rocket motors is described. The effect of aging on the mechanical properties of two externally plasticized epoxy resins was determined. For several resins, asbestos fibers, potassium oxalate, and magnesium carbonate fillers were evaluated in the oxyacetylene-torch test and static-motor firings. The char rates (from motor firings) and densities for the motor promising systems were: 3.0 mil/sec, 1.41 gm/cu cm for an asbestos-filled Epon 328-Nadic methyl anhydride-castor oil formulation; 2.4 mil/sec, 1.52 gm/cu cm for an asbestos-filled Araldite DP-437 NMA formulation; 2.7 mil/sec, 1.37 gm/cu cm for an asbestos-filled nonyl phenol-formaldehyde-Syl-Kem 90 formulation and 2.1 mil/sec, 1.50 gm/cu cm for asbestos-oxalate-filled phenol-formaldehyde-Syl-Kem 90 formulation. (Author)

AD-282 752 Div. 27, 7, 12
(TISTA/GEC) OTS price $5.60

General Electric Co., Cincinnati, Ohio.
SPACECRAFT ELECTRIC GENERATING AND PROPULSION SYSTEM INTEGRATION.
Quarterly status rept. no. 1 for period ending 30 June 62.
30 June 62, 49p. incl. illus. tables.
(Contract AF 33(657)8488)
Unclassified report

DESCRIPTORS: *Satellite vehicles, *Plasma jet, *Electric power production, *Electric propulsion, Air force operations, Research program administration, Computers, Programming, Nuclear propulsion, Shielding, Electric cables, Design, Rocket propulsion, Space flight.

This rept. includes:
APPLICATION OF A 300 KW ARC JET PROPULSION SYSTEM, by H. E. Nicoll, Jr. 26 Apr 62, (Rept. no. DM 62-126)

Contents:
Application of Leader to a system comprised of a number of sub-systems
Space transmission line problem
Leader computation program development
ASD computer activity
Detailed reporting forecast
Problem analysis
Forecast activity
Comparison testing
Mission analysis

AD-282 793 Div. 27, 10
(TISTM/MS) OTS price $6.60

Phillips Petroleum Co., Bartlesville, Okla.
GAS TURBINE AND JET ENGINE FUELS.
Summary rept., 1 Jan 61-31 Mar 62,
by William L. Streets. 25 May 62, 56p. incl. illus. tables, 19 refs. (Research division rept. no. 3185-62R)
(Contract NOw 61-0590-d)
Unclassified report

DESCRIPTORS: *Jet engine fuels, *Turbojet engines, *Sea water, Guide vanes, Reliability, Combustion chambers, Combustion chamber liners, Erosion, Flames, Combustion chamber gases, Stainless steel, Hydrocarbons, Combustion, High temperature research, Test equipment, Tests, Sulfur, Corrosion, Jet engine inlets.

AD-282 941 Div. 27
(TISTW/RD) OTS price $2.60

Naval Research Lab., Washington, D. C.
THERMAL IONIZATION OF ROCKET EXHAUST PLASMAS.
Interim rept.,
by W. W. Balwanz and B. N. Navid. 30 July 62, 22p. incl. illus. 8 refs. (NRL rept. no. 5808)
Unclassified report

DESCRIPTORS: *Ionization, *Exhaust gases, Gas ionization, Plasma physics, Rocket motors, Thermodynamics.

Thermal or equilibrium processes contribute to the total ionization of the exhaust plasmas attending a missile in flight. Such equilibrium ionization is the principal contributor to the total ionization in some cases of interest. Calculations of the equilibrium values of ionization for various rocket-propellant components are presented in graphical form to make numeric values readily available and to simplify their utilization. (Author)

AD-282 961 Div. 27, 9
(TISTP/WH) OTS price $10.10

Pennsylvania State U. Coll. of Engineering and Architecture, University Park.
A WATER MODEL STUDY OF VORTEX FLOW IN COMBUSTION CHAMBERS,

by Joseph B. Mayers. Aug 62, 110p. incl. illus. tables, 9 refs. (Technical rept. no. 1)
(Contract DA 36-034-ORD-3366)
Unclassified report

DESCRIPTORS: *Combustion chambers, *Vortices, *Fluid mechanics, *Gas flow, *Analog systems, Hydraulic models, Gas cylinders, Turbulent flow.

The relationships that exist between the actual gas flow case in gas cylinders and the two dimensional, free-surface water model is used to study the effect of combustion chamber geometry on the induced flows, by determining approximate flow data from water models of several chambers of known engine performance. (Author)

AD-283 090 Div. 27, 31
(TISTW/RD) OTS price $13.50

Electric Boat Div., General Dynamics Corp., Groton, Conn.
PROPULSION MACHINERY AND PITCH CHANGING SYSTEMS FOR THE TANDEM PROPELLER.
Interim rept. no. 1,
by T. J. Gerken, A. C. McClure, and M. Wieser.
30 June 62, 187p. incl. illus. tables (Rept. no. U413-62-092)
(Contract Nonr-338300; Subcontract to General Electric Co., Schenectady, N. Y., and Elliott Co., Jeannette, Pa.)
Unclassified report

DESCRIPTORS: *Underwater propulsion, *Marine propellers, *Electric propulsion, Variable pitch propellers, Pitch, Electric motors, Thrust bearings, Journal bearings, Submarines.

A study is made of a turboelectric submarine propulsion system incorporating propellers at both ends of the ship. The propellers are driven by free-flooding motors located in the propeller hubs. Propeller blades are arranged to be controllable in pitch individually, and hence provide directed thrust for ship control. Design requirements for machinery and pitch changing systems are developed, and a feasible design is evolved. (Author)

## 28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-281 868 Div. 28
(TISTB/AW) OTS price $2.60

California U., Los Angeles.
SOCIAL REFERENTS AND SELF EVALUATION IN EXAMINATIONS.
Technical rept. no. 7 on Dynamics of Social Influence,
by Bertram H. Raven and Martin Fishbein.
15 June 62, 21p. incl. tables, 17 refs.
(Contract Nonr-23354, Proj. NR 171-350)
Unclassified report

DESCRIPTORS: *Psychology, *Group dynamics, *Social communication, Theory, Reasoning.

Students were asked after each of three examinations to estimate (1) what score they would obtain on that examination, (2) their minimal goal (the lowest score with which they would be satisfied), (3) the average score obtained by students in that class. Data from 562 respondents are analyzed to determine the bases for self-evaluation. Before making their estimates on each of the exams, 272 students in a 'Referent' condition were given the average score of male pre-medical students. The remaining 290 respondents, in the 'No Referent' condition, were not given any such information. With no social referent, and no experience on the first examination, correlation between predicted and obtained scores is very low (r = .21). Accuracy of prediction increases on successive examinations, reaching a correlation of .42 on the third examination. Where there is no social referent and no experience, there is autistic distortion--a tendency to overestimate one's performance. Such distortion is particularly evident among students who score poorly. Autism is reduced on successive examinations, and particularly when a social referent is provided. The social referent results in much greater accuracy in the first examination, compensating for lack of experience. Other factors in self evaluation and evaluation of others are also examined. (Author)

AD-281 884 Div. 28
(TISTB/AW) OTS price $3.60

California U., Los Angeles.
COOPERATION AND COMPETITION IN MEANS-INTERDEPENDENT TRIADS.
Technical rept. no. 8 on Dynamics of Social Influence,
by Bertram H. Raven and H. Todd Eachus.
28 June 62, 29p. incl. illus. tables, 20 refs.
(Contract Nonr-23354, Proj. 171-350)
Unclassified report

DESCRIPTORS: *Group dynamics, Behavior, Effectiveness, Leadership.

One hundred twenty male undergraduates in 40 triads took part in an experimental situation which involved high interdependence with respect to means. In all triads, each subject had a spirit level before him which could be brought into level only through behavior of the other two. Half the triads were given competitive instructions--to get their own corner level as soon as possible; half were given cooperative instructions--to get the board (all three levels) level as soon as possible. In ten of the cooperative and ten competitive triads, the operations of one S were immobilized, so that he could not affect the levels of the others or his own. As predicted and consistent with findings by Deutsch and others, cooperative triads, as compared to competitive, were more efficient in getting the corners level, evaluated fellow team members more favorably, showed less signs of hostility, were more attracted to the task, were more likely to develop leaders. In addition, there was greater concern for personal performance in the cooperative triads. Unsupported were hypotheses of greater concern with team performance and less coalition formation in the cooperative groups, and a hypothesis that differences between cooperative and competitive triads would be greater when the performance of one member of the triad was interfered with. (Author)

AD-281 885 Div. 28
(TISTB/AW) OTS price $2.60

California U., Los Angeles.
SOCIAL COMPARISON AND DISSONANCE REDUCTION IN SELF-EVALUATION.
Technical rept. no. 9 on Dynamics of Social Influence,
by Martin Fishbein, Bertram H. Raven, and

Ronda Hunter, 2 July 62, 26p. incl. tables, 11 refs.
(Contract Nonr-23354, Proj. NR 171-350; In cooperation with Illinois U.)
Unclassified report

DESCRIPTORS: *Psychology, *Group dynamics, Social communication, Reasoning, Theory, Reaction (Psychology), Behavior.

Students were asked to estimate (1) what score they would obtain on an examination, and (2) their minimal goal (the lowest score with which they would be satisfied). Data from a total of 760 students are analyzed to determine the bases of self-evaluation. Members of one class received no information before making evaluations. Members of a second class were given a score presumably made by pre-medical students, before these respondents made their estimates on each exam. Members of a third class were given no information on the first exam; on the second exam, half were given presumed scores of male pre-med students, half were given scores of female education students. Contrary to suggestions by Rotter (1954), it was found that minimal goals were no more resistant to change than expected scores. Changes in minimal goals and expected scores tended to occur so as to minimize discrepancies, thus reduce dissonance in accordance with Festinger's theory (1957). Individual's self-evaluations are influenced by reference norms, but only in the absence of a more objective criterion for self-evaluation, such as knowledge of previous performance. (Author)

AD-281 886 Div. 28
(TISTB/AW) OTS price $2.60

California U., Los Angeles.
THE EFFECTS OF ATTRIBUTED ABILITY UPON EXPERT AND REFERENT INFLUENCE.
Technical rept. no. 10 on Dynamics of Social Influence,
by Bertram H. Raven, Helge H. Mansson, and Edwin Anthony. 16 July 62, 23p. incl. illus. tables, 22 refs.
(Contract Nonr-23354, Proj. 171-350)
Unclassified report

DESCRIPTORS: *Psychology, *Reasoning, *Group dynamics, Social communication, Public opinion, Reaction (Psychology), Sensory perception, Perception, Identification.

Continuing from an earlier study by (Raven, Anthony, & Mansson, 1960), 72 female subjects met in groups of four, each in a separate booth, and were asked to report whether or not they received 'ESP images' which were presumably projected by a 'sender' in another room. By means of a device similar to that first reported by Deutsch and Gerard (1955), each subject was given the impression that the other three subjects had received images on 23 of 30 trials. Twenty-four subjects were given the impression that their co-participants had unusually high perceptual ability; 24 were told that their partners were slightly above average in perceptual ability; the remaining 24 were told that the others were unusually fallible in perceptual ability. It was predicted that referent influence would be predominant insofar as reporting receptions was concerned. More subjects would report reception in the condition in which moderate perceptual ability was attributed to others, less reception would be reported in the other two conditions. Expert influence would operate on belief in ESP--subjects in the high attributed ability condition would end the experiment believing more positively in ESP than would subjects in the negative condition. (Author)

AD-281 890 Div. 28
(TISTB/AW) OTS price $2.60

Educational Testing Service, Princeton, N. J.
SUCCESSFUL JUDGMENT IN AN INTERPERSONAL SENSITIVITY TASK,
by Norman Cliff. July 62, 19p. incl. tables, 16 refs. (Rept. no. RB-62-18)
(Contract Nonr-233800, Proj. NR 151-182)
Unclassified report

DESCRIPTORS: *Reasoning, *Perception, *Psychometrics, Behavior, Sensitivity, Measurement, Design.

The Social Judgment Test was developed as a measure of a judge's ability to perceive individual differences in behavior and to apply these perceptions so as to recognize the individuals in other situations from their behavior. The behaviors used in the test were the written responses of a number of target individuals responding to the same situation, a complex simulation of administrative behavior. The test employed a matching procedure. Differences in the degree to which the judges were acquainted with the targets were eliminated, and all target individuals were playing the same role, in the same situations, mean scores were only somewhat (although highly significantly) above the chance level and the differences among Js in their ability to correctly identify targets were only minimally consistent. These findings were obtained in spite of the fact that an attempt was made to select maximally discriminable targets. Although it is possible that the results are a consequence of the specific testing format and materials used, we advance the hypothesis that individual differences in ability to predict the behavior of others, apart from situational factors, is of minimal importance to successful prediction. (Author)

AD-281 907 Div. 28
(TISTB/AW) OTS price $4.60

System Development Corp., Santa Monica, Calif.
A REVIEW OF THE GROUP DECISION-MAKING RESEARCH PROJECTS,
by Robert J. Meeker, Gerald H. Shure, and Miles S. Rogers. 25 June 62, 47p. incl. illus. 14 refs. (Technical memo. no. TM-731)
Unclassified report

DESCRIPTORS: *Decision making, Man, Analysis, Military operations, Command systems, Group dynamics, Air Defense Command, Simulation.

A series of investigations related to decision-making behavior conducted at SDC are reviewed. An overview which relates the various activities undertaken is presented. The document consists of three major parts. In the first part, the objectives of the study are reviewed; those aspects of the project previously reported are briefly explained with references to specific documents. The second part is devoted to a more detailed report of experimental results and problems associated with realization of some of the investigators' aspirations. This discussion points up empirical, methodological, and theoretical difficulties. The third part reports some disquieting observations which derive from the realistic setting of the study and which suggest the limitations of both theory and experiment based exclusively on tractable and tidy assumptions. In the appendix, a computer flow chart approach is illustrated as a potentially profitable model format for representing many of these problems and observations. (Author)

AD-281 919 Div. 28, 16
(TISTB/AW) OTS price $1.60

California U., Los Angeles.
PSYCHOPHYSIOLOGY OF PERCEPTION.
July 62, 17p. incl. illus.
(Contract DA 49-007-md-722)
Unclassified report

DESCRIPTORS: *Visual perception, Theory, Test methods, Eye, Motion, Electroencephalography, Contact lenses, Brain.

Contents:
Perceptual blanking studies completed and in preparation for publication
Investigation of the phenomenon of perceptual blanking
Peripheral and central factors in perceptual blanking: binocular versus dichopic results
An investigation of residual effects of blanking using three flashes
Abstracts of doctoral dissertations on perceptual blanking
The perceptual interference of successively presented visual stimuli
An investigation of the latency hypothesis of perceptual interference with successive visual presentations
Studies of stabilized images nearing completion
Correlated changes in the EEG during viewing of a stabilized image
The interaction of simultaneous foveal and parafoveal stabilized images
Effects of eye movements and sharp edges in a flickering field

AD-281 936 Div. 28
(TISTB/MS) OTS price $7.00

National Research Council, Washington, D. C.
STUDENT RESPONSE IN PROGRAMMED INSTRUCTION. A SYMPOSIUM ON EXPERIMENTAL STUDIES OF CUE AND RESPONSE FACTORS IN GROUP AND INDIVIDUAL LEARNING FROM INSTRUCTIONAL MEDIA,
ed. by A. A. Lumsdaine. 1961. 555p. incl. illus. tables, 343 refs. (Publ. no. 943)
(Sponsored by Headquarters, Air Research and Development Command, U. S. Air Force)
Unclassified report

DESCRIPTORS: *Teaching machines, *Reaction (Psychology), *Learning, *Training, Symposia, Verbal behavior, Films, Programming, Effectiveness.

AD-282 137 Div. 28
(TISTB/AW) OTS price $8.10

Dunlap and Associates, Inc., Stamford, Conn.
GUIDE TO THE CODING OF CONTROLS.
Final rept. on Task .02B,
by Alin Gruber, Edward W. Bishop and others.
Jan 62, 74p. incl. illus. tables, 7 refs.
(Contract DA 36-039-sc-78921)
Unclassified report

DESCRIPTORS: *Human engineering, *Instrument panels, *Control panels, *Control knobs, *Control sticks, Military equipment, Specifications, Colors, Coding, Motion, Standardization.

The purposes of control coding and standardizing control coding are discussed. Six coding methods are described: location coding; labeling; color coding; shape coding; size coding; and mode of operation coding. For each method the following are provided: a description of the method; the conditions for use; the major advantages and disadvantages; considerations toward standardizing its use; and a summary of recommendations regarding when to and when not to use the method. A summary table which covers the foregoing factors is also provided. The physical physiological and psychological considerations which affect the application of coding are discussed, and a number of recommendations and good practices are offered. This is followed by a discussion of factors influencing the assignment of priorities to controls for coding purposes. A procedure for developing control priorities is suggested. The document concludes with a discussion of standardizing the coding of controls across related equipments. (Author)

AD-282 175 Div. 28
(TISTB/AW) OTS price $5.60

Yale U., New Haven, Conn.
THE DIMENSIONS OF PHYSICAL FITNESS-THE NATION-WIDE NORMATIVE AND DEVELOPMENTAL STUDY OF BASIC TESTS.
Technical rept. no. 4 on The Development of Criteria of Physical Proficiency,
by Edwin A. Fleishman. Aug 62, 45p. incl. illus. tables, 4 refs.
(Contract Nonr-60932)
Unclassified report

DESCRIPTORS: *Physical fitness, *Exercise, Tests, Measurement, Analysis, Standardization, Design, Growth, Age, Sex.

Thirteen tests, measuring eight physical fitness factors, were administered to over 20,000 students between the ages of 12 and 18 in 45 cities throughout the U.S. The primary products of this effort are (1) the normative tables by which individual performance can be evaluated by test, age, and sex and (2) the 'growth curves' which show the development of the different physical proficiency components during the adolescent and subadult period. Finally, recommendations are made for batteries of tests which provide a more comprehensive and efficient coverage of physical fitness factors than do commonly used batteries in this area. The present report builds on earlier studies in this series which attempted to isolate and define the ability factors in this area of motor skill and to specify the tests most diagnostic of these ability factors. Any research program raises questions along with those it answers, and we have pointed these out along the way. These results should provide additional guidance to those engaged in physical fitness programs. The primary contribution lies in providing standards for the evaluation of individuals and programs in this area. (Author)

AD-282 281 Div. 28
(TISTB/AW) OTS price $2.25

Behavioral Sciences Lab., Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
A BIBLIOGRAPHY OF REPORTS ISSUED BY THE BEHAVIORAL SCIENCES LABORATORY: ENGINEERING PSYCHOLOGY, TRAINING PSYCHOLOGY, ENVIRONMENTAL STRESS, SIMULATION TECHNIQUES AND PHYSICAL ANTHROPOLOGY,
comp. by L. Jean Thomas. June 62, 78p.
Unclassified report

DESCRIPTORS: *Bibliography, *Military psychology, *Human engineering, Training, Stress (Physiology), Stress (Psychology), Simulation, Anthropology, Anthropometry, Handbooks, Personnel, Attention, Display systems, Instrumentation, Sleep, Dark adaptation, Vision, Visibility, Auditory signals, Perception, Tracking, Weightlessness, Speech, Target recognition, Transfer of training, Colors, Coding, Temperature, Climatic factors.

# Division 28 - PSYCHOLOGY AND HUMAN ENGINEERING

This bibliography lists technical reports, technical notes, contractor reports, memorandum reports, and journal articles prepared by the Behavioral Sciences Laboratory and its contractors from 1945 through 1961. The Behavioral Sciences Laboratory conducts research and development in the fields of human engineering, training, psychophysiology, physical anthropology, and simulation techniques. The Human Engineering Branch executes research and development on human performance capabilities and limitations as they relate to operation and maintenance of aircraft, missile, and manned space vehicle systems. The Training Research Branch accomplishes research and technical development in the areas of training techniques, psychological and engineering aspects of training equipment, personnel requirements of new weapon systems, and the effects of environmental stress on human performance.

AD-282 366 Div. 28
(TISTB/AW) OTS price $9.60

Group Effectiveness Research Lab., U. of Illinois, Urbana.
SOME COGNITIVE FACTORS AFFECTING GROUP CREATIVITY,
by Harry C. Triandis, Eleanor H. Mikesell, and Robert B. Ewen. May 62, 111p. incl. illus. tables, refs. (Technical rept. no. 5)
(Contract Nonr-183436, Proj. NR 177-472)
Unclassified report

DESCRIPTORS: *Group dynamics, Reasoning, Factor analysis, Measurement, Design, Psychometrics, Effectiveness, Personality, Leadership, Attitudes.

This report includes:
TEAM CREATIVITY AS A FUNCTION OF THE CREATIVITY OF THE MEMBERS, by Harry C. Triandis, Alan R. Bass and others. Apr 62 (Technical rept. no. 6)

Data from experiments on cognitive factors which affect group creativity suggest that the relationship of group heterogeneity to group creativity is much more complex than was suspected by either Kelley and Thibaut (1954) or Campbell (1960). A procedure is derived for the study of dyadic creativity. The most significant variables determining group creativity was derived. Mapping the relationships between variables and stating the conditional laws specifying these relationships is yet to be studied. The second report is a first step towards the determination of the relationship of group and individual performance in groups of more than two individuals.

AD-282 514 Div. 28, 23
(TISTB/AW) OTS price $1.60

Bioastronautics Div., Air Force Proving Ground Command, Eglin Air Force Base, Fla.
A BIBLIOGRAPHY OF RESEARCH REPORTS AND PUBLICATIONS IN THE AREAS OF HUMAN PERFORMANCE AND PERSONNEL SUBSYSTEM TEST AND EVALUATION,
by William H. McAbee. Aug 62, 15p. 144 refs.
(PGN Document no. 62-3)
Unclassified report

DESCRIPTORS: *Astronautics, *Bibliography, *Human engineering, Military training, Hazards, Guided missiles, Display systems, Control systems, Radar operators, Safety, Military personnel, Maintenance, Handling, Aviation personnel, Weapons, Radar, Training devices, Effectiveness, Design, Radiation hazards.

AD-282 531 Div. 28
(TISTB/MS) OTS price $2.60

Harvard U. Graduate School of Education, Cambridge, Mass.
THREE PERSONALITY ELEMENTS IN THE CAPACITY OF TECHNOLOGY FRESHMEN TO MEET CURRICULUM DEMANDS,
by Robert G. Congdon. Oct 61, 19p. tables, 25 refs. (Technical rept. no. 17; Harvard Studies in Career Development no. 20)
(Contract Nonr-186631)
Unclassified report

DESCRIPTORS: *Education, *Behavior, *Personality, Psychology, Students, Needs.

AD-282 532 Div. 28
(TISTB/MS) OTS price $5.60

Harvard U. Graduate School of Education, Cambridge, Mass.
DISPERSION ANALYSIS AND THE SEARCH FOR EDUCATIONAL GOALS IN COLLEGE: A STUDY IN DUPLICATE,
by Joseph W. Cole, Kenneth M. Wilson and David V. Tiedeman. Jan 62, 36p. tables, 17 refs. (Technical rept. no. 16; Harvard Studies in Career Development no. 19)
(Contract Nonr-186631)
Unclassified report

DESCRIPTORS: *Education, *Behavior, *Personality, Theory, Aptitude tests, Selection, Statistical analysis, Statistical tests, Probability, Measurement, Decision making, Psychology, Students, Needs.

AD-282 534 Div. 28
(TISTB/MS) OTS price $6.60

Harvard U. Graduate School of Education, Cambridge, Mass.
A CRITICAL ANALYSIS OF ATTEMPTS TO DENOTE SELF-CONCEPT,
by Chris D. Kehas. Apr 62, 63p. 105 refs. (Technical rept. no. 23; Harvard Studies in Career Development no. 25)
(Contract Nonr-186631)
Unclassified report

DESCRIPTORS: *Personality, Education, Psychology, Language, Behavior, Theory.

Contents:
Theoretical contexts
Major referents of conceptualization
Aspects of self-concept
  Self
  Concept
  Self report
  Organization
  Conscious-unconscious
  Ontology
  Development
Concluding remarks
  Movement in theory
  The process dimension
  The evaluative dimension
  The specificity of the notion self-concept

AD-282 535 Div. 28
(TISTB/MS) OTS price $7.60

Harvard U. Graduate School of Education, Cambridge, Mass.
SELF AS PROCESS: A REVISION OF VOCATIONAL THEORY DIRECTED TOWARD THE STUDY OF INDIVIDUAL DEVELOPMENT IN THE VOCATIONAL SITUATION,

by Frank L. Field. May 62, 65p. refs. (Technical rept. no. 23; Harvard Studies in Career Development no. 26)
(Contract Nonr-186631)
Unclassified report

DESCRIPTORS: *Behavior, *Job analysis, *Adjustment (Psychology), Education, Theory, Personality.

An attempt was made to describe and emphasize the dynamic and partially irrational character of individual development-in-vocation. The writer's concern with dynamics resulted from the discovery that several other disciplines have developed more solid conceptual bridges between observed processes on one hand and their description through static, written terms on the other. In addition to making the writer discontent with static theoretical referents, these disciplines suggested an approach to its revision into theory with dynamic referents. This approach has been taken with regard to both the evaluation and the construction of theory. (Author)

AD-282 619 Div. 28, 8
(TISTB/CCH) OTS price $12.50

University of Southern Calif., Los Angeles.
HUMAN FACTORS RESEARCH IN ELECTRONICS MAINTENANCE: AN ANALYSIS OF RECENT TRENDS, WITH SOME SUGGESTIONS FOR THE FUTURE,
by Joseph W. Rigney and Lyle S. Hoffman.
July 62, 168p. incl. illus. refs. (Technical rept. no. 35)
(Contract Nonr-22822, Proj. NR 153-093)
Unclassified report

DESCRIPTORS: *Human engineering, *Maintenance personnel, *Electronics, Automation, Handbooks, Maintenance.

The present status of human factors research and development in the electronics maintenance field and some needed research approaches for the future are assessed. Selected literature pertaining to maintenance was reviewed to uncover important trends. Six broad areas are identified, and representative studies in each, along with their implications, are discussed. (1) The measurement of maintainability of equipment in the field has been attempted from a time-oriented and a feature-oriented base. Procedures for predicting the maintainability of future equipment rely on simulating failure rates and repair actions. (2) Numerous military standards and specifications, and human factors handbooks to guide the design of equipment for maintainability have been produced. (3) The automation of maintenance tasks, by means of automated test equipment, has been a major effort in the development of most large equipment systems. (4) There have been relatively few studies of maintenance variables which have used the classical experimental method. (5) Many investigations in traditional personnel areas have been conducted in the maintenance field. (6) Mathematical modeling techniques are being used to simulate human problem solving and other complex behavioral processes. (Author)

AD-282 646 Div. 28
(TISTB/AW) OTS price $2.60

National Training Labs., Washington, D. C.
A FRAMEWORK FOR EXAMINING CHANGE.
Technical rept. no. 9 on Factors Determining Defensive Behavior Within Groups,
by Jack R. Gibb. Nov 61, 23p. incl. illus.
(Contract Nonr-308800; In cooperation with Delaware U., Contract Nonr-228501 and Colorado U., Contract Nonr-114703)
Unclassified report

DESCRIPTORS: *Group dynamics, *Personality, Behavior, Emotions, Theory, Psychology, Needs, Attitudes, Children.

A report from a series of Change Induction Seminars devoted to examination of research which relates group variables to induction of changes in individual behavior, particularly as this behavior represents generalized or relatively permanent change in the behavior of group members, is given. A simple ten-category schematization of the change process that is descriptive and programmatic in nature. This schematization performs preliminary functions for the Defensive Behavior Program. (Author)

AD-282 665 Div. 28
(TISTB/CCH) OTS price $6.60

Human Resources Research Office, George Washington U., Washington, D. C.
HUMAN RESOURCES RESEARCH OFFICE BIBLIOGRAPHY OF REPORTS AS OF 30 JUNE 1962.
July 62, 61p. refs.
(Contract DA 44-188-ARO-2)
Unclassified report

DESCRIPTORS: *Bibliography, *Human engineering, Scientific research, Scientific reports.

AD-282 724 Div. 28, 25
(TISTB/CCH) OTS price $1.00

Arizona U., Tucson.
A QUANTITATIVE MODEL FOR LOUDNESS DISCRIMINATION.
Final rept. on Biological Information Handling Systems and Their Functional Analogs,
by John L. Stewart. Mar 62, 28p. incl. illus. 26 refs.
(Contract AF 33(616)7800, Proj. 7233)
(MRL TDR 62-12) Unclassified report

DESCRIPTORS: *Psychoacoustics, Acoustic detectors, Information theory, Sensory perception, Statistical processes.

A loudness function based on detailed waveform manipulations and predicting well-known empirical results is hypothesized. The loudness function is stated for a sine wave signal as well as for a Gaussian signal in noise. Additional hypotheses provide analytic expressions which predict several psychoacoustic phenomena. One hypothesis leads to prediction of difference limens at both small and medium intensity levels and provides a major departure from the classic concepts due to Weber and Fechner. Another provides an accurate quantitative theory for masking. A third leads to an explanation for a type of monaural diplacusis and suggests a multicomponent pattern recognition representation for hearing which involves an artificial cochlea. The pattern system is extended to suggest mechanisms for language-independent bandwidth reduction to less than 10 cycles per second. The pertinent analog model may in addition display imperfections emulating human behavior. The theory suggests several test procedures which may be of use in clinical applications. Extensions to sense modalities other than hearing are indicated. (Author)

# Division 28 - PSYCHOLOGY AND HUMAN ENGINEERING

AD-282 780 Div. 28, 16
(TISTB/CCH) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
HUMAN CAPABILITIES IN THE PRONE AND SUPINE POSITIONS: AN ANNOTATED BIBLIOGRAPHY,
comp. by Jack B. Goldmann. May 62, 19p. (Special bibliography no. SB-62-14; Rept. no. 3-80-62-8)
(Contract NOrd-17017)
Unclassified report

DESCRIPTORS: *Bibliography, *Human engineering, *Space flight, Positioning reactions, Reaction (Psychology), Effectiveness, Anthropometry.

This literature search covers the decade, 1951-1961. The ability of man to perform basic operations in aircraft while relegated to a prone or supine position and the possible application of man's performance in spacecraft under similar conditions is discussed. References to the design requirements for man are included. (Author)

AD-282 853 Div. 28
(TISTB/AW) OTS price $2.75

Harvard U. Medical School, Boston, Mass.
IMAGERY AND SENSORY DEPRIVATION, AN EXPERIMENTAL STUDY.
Final rept., 1 Dec 58-15 Sep 61 on Biophysics Research,
by P. Herbert Leiderman. May 62, 111p. incl. illus. tables, 53 refs.
(Contract AF 33(616)6110, Proj. 7220)
(MRL TDR 62-28) Unclassified report

DESCRIPTORS: *Sensory deprivation, *Stress (Psychology), *Optical illusions, *Auditory illusions, Physiology, Adjustment (Psychology) Personality, Body, Motion, Test methods, Measurement, Electroencephalography.

The effect of repeated exposure of the same individual to short periods of sensory deprivation and isolation was evaluated. Behavioral and physiological responses were measured and their relationship to modification of visual input determined. The results suggest that physiological adaptation to isolation continues over several sessions. The presence of visual imagery in a subject appeared to be related to the individual personality, and not to the conditions of deprivation. Auditory and somesthetic imagery appeared to be related to the type of deprivation, Body movement response was negatively related to the amount of imagery. The findings point up the importance of non-imagery factors as measures of stress and the importance of assessing individual differences in imagery responses under conditions of isolation. (Author)

AD-282 975 Div. 28
(TISTB/AW) OTS price $2.60

Quartermaster Food and Container Inst. for the Armed Forces, Chicago, Ill.
FOOD PREFERENCES IN A STRESSFUL SITUATION.
Interim rept. on Human Factors in QM Corps Operations,
by Joseph M. Kamen. Aug 62, 27p. incl. tables, 9 refs. (QMFCIAF rept. no. 31-62)
Unclassified report

DESCRIPTORS: *Appetite, *Consumption, *Parachute jumping, Food, Stress (Psychology), Attitudes, Diet, Military personnel, Military training, Anxiety, Fear. Test methods.

Over 800 soldiers in eight phases of paratrooper training were asked to indicate their immediate preferences for each of 50 foods. Questionnaires designed to assess stress-arousal, or anxiety, were also administered. On a priori grounds, and later confirmed by the results from the anxiety questionnaires, four phases of training were classified as stressful (e.g., immediately before first jump from airplane) and four were considered non-stressful (e.g., graducation) or representing recovery from stress (e.g., after first jump from airplane). Preferences for desserts, and to a lesser extent for fruits and juices, were significantly higher during the non-stressful phases, but preferences for main dishes showed the opposite effect, higher during stress than under no-stress. The absolute shifts in preferences for any class of foods were in no case higher than 0.24 scale points, and the differences between stress and non-stress phases did not seem to be of much practical importance. (Author)

AD-283 056 Div. 28
(TISTB/AW) OTS price $1.10

Georgetown U., Washington, D. C.
PSYCHO-SOCIAL DEVELOPMENTAL PHASES, THE PERSONALITY DISORDERS, AND THE PROVERBS TEST,
by John H. Rohrer. Aug 62, 6p. illus.
(Contract Nonr-153007)
Unclassified report

DESCRIPTORS: *Psychiatry, *Personality tests, Attitudes, Personality, Theory, Identification. Psychometrics, Design, Growth.

The empirical Proverbs Test items are related to the theoretical structure from which they were derived. The empirically derived scores for items on the Proverbs Test were weighted to maximize the identification of individuals diagnosed as Character and Personality Disorders. These scores were related to the theoretical psycho-social phases derived from the writings of Erickson. The empirical derivation of the final test forms were based on the study of over 2,000 young men between the ages of 17 and 25. The two forms of the Proverbs Test are not equivalent forms. (Author)

AD-283 057 Div. 28
(TISTB/AW) OTS price $1.10

Georgetown U., Washington, D. C.
THE IDENTIFICATION OF YOUNG LADIES DIAGNOSED AS PERSONALITY AND CHARACTER DISORDERS, THROUGH THE USE OF THE PROVERBIAL ATTITUDES TEST,
by John H. Rohrer. Aug 62, 4p.
(Contract Nonr-153007)
Unclassified report

DESCRIPTORS: *Personality tests, *Attitudes, Women, Psychometrics, Naval personnel, Personality, Military psychology, Recruiting, Analysis, Identification, Psychiatry.

Two forms of a Proverbs Test were developed that discriminated between young males who were diagnosed, using the 'Armed Forces Nomenclature', as falling within the 'Character and Personality Disorders' category, and young men who did not receive such a diagnosis. To test the generality of the test for identifying the personality and character disorders, both forms of the test were administered to a group of approximately 1,500 incoming women recruits. There were 91 of these young ladies who were diagnosed as having

personality and character disorders. This group made up the experimental group. The control group consisted of 508 young ladies, randomly selected from the remainder of the 1,500 recruits, who had not received the diagnosis of character and personality disorders. (Author)

# 29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-281 833 Div. 29
(TISTB/AW) OTS price $2.60

Naval Radiological Defense Lab., San Francisco, Calif.
RESIDUAL CONTAMINATION OF QUARTERMASTER CORPS CLOTHING AND PACKAGING MATERIALS. RETENTION OF SIMULATED DRY FALLOUT PARTICLES,
by F. K. Kawahara. 23 Mar 62, 29p. incl. illus. tables, 5 refs. (Rept. no. NRDL-TR-557)
Unclassified report

DESCRIPTORS: *Radiological contamination, *Radioactive fall-out, Simulation, Particles, Clothing, Abundance, Decontamination, Textiles, Adhesion.

The amount and size of simulated dry fallout particles retained by various Quartermaster Corps clothing and packaging materials were determined after application of field decontamination procedures. An attempt was made to correlate qualitatively the amount retained with surface properties of the materials. Dry spherical, glass beads in selected size-distribution groups (14-270, 14-100, and 14-75 microns) were used to simulate fallout particles from a nuclear detonation. The amount remaining was measured gravimetrically and visually by optical microscope after application of three mechanical removal operations. Materials having entrapping fibers retained the largest amount of beads. The amount was directly proportional to the number of open spaces and the number of loose fibers that acted as entrappers. Scrim-back packaging material measured 0.3 g per square foot of particles which had an average diameter of 50 microns. Cotton sateen clothing and cotton poplin clothing had lesser amounts. All other materials tested retained zero or insignificant amounts. Mechanical entrapment of particles by the loose fibers appeared to be the principal mechanism of retention. (Author)

AD-282 669 Div. 29, 16, 1
(TISTB/MD) OTS price $.50

6570th Aerospace Medical Research Labs., Aerospace Medical Div., Wright-Patterson Air Force Base, Ohio.
ANALYSIS OF NONUNIFORM SUIT TEMPERATURES FOR SPACE SUITS IN ORBIT.
Rept. for Nov 59-Apr 61 on Phase 2, Aerospace Systems Personnel Protection,
by Kenneth R. Cramer and Thomas F. Irvine, Jr. Mar 62, 8p. incl. illus. 1 ref. (Rept. no. MRL TDR 62-8)
(Proj. 6301)
Unclassified report

DESCRIPTORS: *Space medicine, *Pressure suits, Simulation, Design, Mathematical analysis, Space flight, Flight clothing, Heat transfer, Temperature control, Temperature, Thermal insulation, Thickness.

A cylindrical model of a space suit exposed to solar and metabolic heating is analyzed mathematically to determine the design criteria for minimizing equilibrium temperature differences. Resulting suit shell thicknesses are compared with those of a previous analysis that utilized the material thermal capacity and surface spectral properties to establish passive nonequilibrium temperature control. Results demonstrate that light-metal suits will develop small equilibrium temperature differences and be very heavy. Fabric suits of similar design will be even heavier. A water-filled suit shell is recommended as an attractive design approach if required circulation rates are practical. (Author)

AD-282 973 Div. 29
(TISTB/SJR) OTS price $2.60

Quartermaster Food and Container Inst. for the Armed Forces, Chicago, Ill.
EFFECT OF TEMPERATURE ON THE TENDERNESS OF COOKED BEEF.
Interim rept.,
by J. M. Tuomy, R. J. Lechnir, and Terrance Miller. Aug 62, 24p. incl. illus. tables, 12 refs. (QMFCIAF rept. no. 28-62)
(Proj. 7-84-06-032)
Unclassified report

DESCRIPTORS: *Beef, *Meat, Acceptability, Preparation, Temperature.

Beef cooked for various periods of time and at several temperatures was evaluated for ease of cutting, flavor, and tenderness. The degree of tenderness of beef attained through cooking is dependent upon the inherent tenderness of the meat, time, and temperature. The initial effect of heat is toughening due to protein coagulation progressively occurring as the temperature increases. Tenderization of the coagulated protein is a function of temperature and time with little or no tenderization taking place below 180 F. There was no evidence in this study that connective tissue played any part in the toughness of the meat although this probably would not hold true for different cuts. Kramer shear press results correlated highly with panel results for tenderness and cuttability. The work reported is part of a larger study on organoleptic properties of freeze-dried meats and how to measure them objectively. (Author)

AD-283 063 Div. 29
(TISTB/SJR) OTS price $4.60

Northwestern U., Evanston, Ill.
MECHANISMS OF FREEZE DEHYDRATION.
Rept. no. 7 (Final), 29 Sep 59-28 Dec 61,
by J. Edward Sunderland, J. D. Bannister and others. 28 Dec 61, 45p. incl. illus. table, 22 refs.
(Contract DA 19-129-qm-1487)
Unclassified report

DESCRIPTORS: *Freeze drying, *Food, *Meat, Beef, Processing, Heat transfer, Conductivity.

The total normal emissivity of lean beef, beef fat, and freeze dried beef has been measured. For a temperature range of 66 F to 94 F, the emissivities of all substances varied between .73 and .78. The instrument used for the measurements is described. The accuracy of the instrument changes with temperature, but for the temperature range used it is accurate within ± 4%. (Author)

# Division 30 - RESEARCH AND RESEARCH EQUIPMENT

AD-283 064 Div. 29
(TISTB/SJR) OTS price $6.60

Purdue U., Lafayette, Ind.
ENZYMIC ACTIVITY IN FREEZE DRIED FOODS.
Rept. no. 9 (Final), 19 Nov 61-18 Feb 62,
by H. N. Draudt, C. E. Damon and others.
18 Feb 62, 66p. incl. illus. tables, 33 refs.
(Contract DA 19-129-qm-1503, Proj. 7-84-08-031A)

Unclassified report

DESCRIPTORS: *Frozen food, *Food, *Enzymes, Meat, Fruits, Freeze drying, Moisture, Peroxidase, Oxidases, Sucrose, Fatty acids, Stability, Deterioration, Storage.

The effect of storage moisture levels was studied on enzymic and other changes related to browning occurring during the long term storage of peaches and bananas. Factors studied include, polyphenol oxidase, peroxidase, sucrase, alpha and beta amylase, pectinesterase and ascorbase activity as well as changes in free amino groups, reducing sugar and sucrose content. Observations are given on the action of SO2 relative to browning in freeze-dried peaches. The effect of freezing rate on the survival of several enzymes in bananas and peaches was observed. Survival of peroxidase during storage of freeze-dried and frozen peas at different moisture was studied. Lipase activity and production of free fatty acid was following during long term storage and freeze-dried beef. Observations are given on the oxygen uptake and CO2 evolution of freeze-dried beef, pork, chicken light and dark meat and veal during long term storage (up to 6 months at 28 C) at different moisture levels. (Author)

AD-283 108 Div. 29
(TISTB/AW) OTS price $2.60

Naval Air Test Center, Patuxent River, Md.
TEST AND EVALUATION OF EXPERIMENTAL HT-1 FABRIC ANTI-G SUITS AND COVERALLS.
Interim rept. no. 1,
by F. J. Formeller. 18 July 62, 18p. incl. illus. (Serial no. ST35-296)

Unclassified report

DESCRIPTORS: *Pressure suits, *Fire-resistant textiles, Synthetic fibers, Amides, Tests, Acceptability, Military requirements, Flight clothing.

Tests were conducted on the Z-2 and Z-3 type anti-g suits fabricated of 100- and 200-denier HT-1 material to determine their serviceability, anti-g protectiong and comfort. Both the single and double layer HT-1 anti-g suits are acceptable with regard to thermal comfort, serviceability, and adequacy as an anti-g suit. However, lack of taper and reefing zippers on the Z-2 suit and uncomfortable pressure points caused by abdominal bladder hose of the Z-3 suit make the suits unacceptable for service use. (Author)

## 30. RESEARCH AND RESEARCH EQUIPMENT

AD-281 735 Div. 30, 8
(TISTP/JW) OTS price $7.60

California U., Los Angeles.
INVESTIGATIONS IN DIGITAL TECHNOLOGY RESEARCH.
Annual summary rept., 1 June 60-31 May 61,
by G. Estrin, C. T. Leondes and others. Apr 62, 77p. incl. illus. tables, refs. (Rept. no. 62-16)
(Contract Nonr-2352)

Unclassified report

DESCRIPTORS: *Digital computers, *Thin films, Magnetostriction, Digital systems, Switching circuits, Control systems, Data processing systems, Spectrographic analysis, Magnetic properties.

This report includes:
SOLUTION OF A BOUNDARY PROBLEM FOR A NONLINEAR PARABOLIC EQUATION OF MOTION OF FLUIDS AND GASSES IN A POROUS MEDIUM, by N. S. Piskunov, tr. by B. Bussell and A. T. Maljuta. (Trans. of Doklady Akademia Nauk SSSR (N.S.) 76:505-508, 1961)

Progress is reported on a continuing feasibility study of the Variable Computer System. Since the results showed the predicted saving in computing times by the factor 2:1000, depending on the types of computations required, the efforts were turned to the crucial questions of establishing communication between the fixed and variable parts, of physical construction of the system, of supervising control and basic inventory, and in particular to the questions of testing and designing of high speed switching elements and packaging. A system to simulate transfers between the IBM 7090 and the variable part of the system has been constructed and the conjecture that 72 bit transfers are feasible in one IBM memory cycle was substantiated. Further problem studies as well as studies of special components, such as content-addressable memory were executed on a limited scale; in addition, studies of procedures in the efficient assignments of the available variable hardware inventory on dynamic basis in parallel processing of one or more problems were initiated. (Author)

AD-281 760 Div. 30
(TISTP/WH) OTS price $7.60

New York U. Coll. of Engineering, N. Y.
AN INTRODUCTION TO THRESHOLD DEVICES AND THEIR USE IN PATTERN RECOGNITION,
by Philip Kaszerman. Aug 61, 68p. incl. illus. tables, 7 refs. (Technical rept. no. 400-44)
(Contract AF 49(638)586, Proj. 9768)
(AFOSR-2414) Unclassified report

DESCRIPTORS: *Switching circuits, *Computer logic, *Digital computers, *Classification.

Introductory concepts are presented of the switching logic which can be realized by threshold devices, and examples are given of the use of these devices in pattern recognition applications. A threshold device is a switching network which realizes a given function by: (1) forming a weighted linear sum on the binary inputs plus a threshold number; and (2) forming a binary output whose value is determined by the value of this sum. It is shown that the complement of a single variable, the AND function of any number of variables and the OR function of any number of variables can be realized by a single threshold device. A necessary condition for realizability by a single threshold device is that the function be completely monotonic; that is, for any two groups of values assigned to a common subset of variables, one of the reduced functions must imply the other. Various properties of realizable functions are derived and a synthesis procedure is presented without proof. In addition, a geometric approach to the analysis of a single threshold device is given. (Author)

AD-281 761 Div. 30
(TISTP/WH) OTS price $3.60

New York U. Coll. of Engineering, N. Y.
CONTROL SYSTEMS PROJECT.
Final rept.,
by S. S. L. Chang and J. Ragazzini. Mar 62, 30p.
(Contract AF 49(638)586, Proj. 9768)
(AFOSR-2855) Unclassified report

DESCRIPTORS: *Control systems, *Theory.

AD-281 826 Div. 30, 31, 22
(TISTP/WH) OTS price $1.60

David Taylor Model Basin, Washington, D. C.
INFORMATION RETRIEVAL AS AN AID TO EQUIPMENT SHOCK DAMAGE ANALYSIS,
by Natalie Tarter. June 62, 13p. incl. illus. ref. (Rept. no. 1633)
Unclassified report

DESCRIPTORS: *Impact shock, *Underwater explosions, *Information retrieval, *Ships, *Data processing systems, Shipborne, Machines, Electronic equipment.

The application is discussed of the information retrieval concept to the problem of compiling and analyzing data on shock damage to equipment collected during underwater explosion tests against operating ships. Included is the theory used in developing general search and print routines for the LARC. The same principles and the basic structure of the routine are applicable to various types of data of different formats and complexity. (Author)

AD-281 829 Div. 30
(TISTP/FR) OTS price $1.75

Hoffman Electronics Corp., El Monte, Calif.
DESIGN STUDY OF SOLAR ENERGY MEASUREMENT TECHNIQUES.
Interim rept., Mar 61-15 Jan 62 on Study and Applied Research on Measurement Techniques for Solar Energy Converters,
by Bernd Ross and D. B. Bickler. June 62, 63p. incl. illus. tables, 9 refs.
(Contract AF 33(616)7946, Proj. 3145)
(ASD TN 61-156) Unclassified report

DESCRIPTORS: *Solar cells, Light, Calibration, Tests, Instrumentation, Computers.

A new primary standard solar cell calibration procedure has been defined which is expected to provide a more nearly absolute basis for determining solar cell performance. A preliminary design for a portable tester is set forth, the purpose of which is to measure the output of solar converter power supplies under a wide range of radiation conditions and extrapolate to space solar radiation conditions. Data on solar cell performance parameters, currents, voltages, etc., as a function of radiant energy intensity and temperature are presented. Spectral response data are presented. (Author)

AD-281 864 Div. 30
(TISTP/FR) OTS price $3.00

International Business Machines Corp., San Jose, Calif.
ADAPT. A SYSTEM FOR THE AUTOMATIC PROGRAMMING OF NUMERICALLY CONTROLLED MACHINE TOOLS ON SMALL COMPUTERS.
Interim technical engineering rept., 15 Jan-15 July 62,
by H. Jeans, E. J. Sinanian and others.
15 July 62, 170p. incl. illus. tables.
(Contract AF 33(600)43365, Proj. ASD 7-870)
(AMC TR 62-7-870) Unclassified report

DESCRIPTORS: *Control, *Programming, Machine tools, Digital computers, Language, Automation.

The ADAPT system is an automatic programming system for numerically controlled machine tools. Its language is English-like and problem-oriented and is compatible with APT language. Developed for use with small digital computers, ADAPT has full two-dimensional geometric capabilities. Commands for tool movements and control are included; and nested definitions, FORTRAN-type expressions and MACRO instructions are allowed. A generalized post-processor set up for the TRW control system will be included. The system is being coded in FORTRAN for demonstration on the IBM 7090. To date the coding of the system is 90% completed, and the checkout is 70% completed. (Author)

AD-281 872 Div. 30
(TISTP/FR) OTS price $3.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
CALIBRATION OF IONIZATION GAGES USING A POROUS PLUG AND ORIFICE,
by Charles L. Owens. Aug 62, 28p. incl. illus. 27 refs. (Rept. no. AEDC-TDR-62-139)
(Contract AF 40(600)1000)
Unclassified report

DESCRIPTORS: *Ionization gages, Calibration, Vacuum systems.

Aerospace research and testing have placed stringent demands on the capabilities of calibration laboratories in the area of very low pressures. The choice of pressure gages and the interpretation of readings obtained are of considerable importance. Quite frequently it is possible to obtain a gage having the desired characteristics. At pressures lower than 1/1000 torr the choice of gages is limited, and the calibration of these gages at low pressures becomes more difficult. The method of calibration described is a result of efforts to improve calibration capabilities in the low pressure area. Commercially available standards were found to have limitations that were not acceptable for calibration purposes. An alternative method was utilized which depended upon fixed and calculable constants of the calibration system. This method was used to obtain reliable results to 10 to the -7th power. (Author)

AD-281 891 Div. 30, 8, 15
(TISTP/JW) OTS price $10.10

Electronics Research Lab., U. of Calif., Berkeley.
NOTES ON SYSTEM THEORY. VOLUME II.
15 Feb 62, 123p. incl. illus. refs. (Series no. 60, issue no. 436)
(Contracts AF 19(604)5466, Nonr-22253 and others)
Unclassified report

DESCRIPTORS: *Electronic systems, *Information theory, *Linear systems, Binomials, Stability, Matrix algebra, Transformations (Mathematics), Relays, Probability, Correlation techniques, Theory.

# Division 30 - RESEARCH AND RESEARCH EQUIPMENT

AD-281 906 Div. 30, 15
(TISTP/WH) OTS price $14.00

Systems Research Center, Case Inst. of Tech., Cleveland, Ohio.
UNCERTAINTY AND OPTIMAL CONTROL.
Research rept.,
by Donald S. Macko. 3 May 62, 196p. incl. illus. tables, 13 refs. (Rept. no. SRC 16-A-62-10)
(Contracts Nonr-114109 and Nonr-114112)
Unclassified report

DESCRIPTORS: *Control systems, *Mathematical analysis, Vector analysis.

The success of so-called optimal control is investigated, by comparing the performance of an optimal control system to the performance of a control system considered as suboptimal, for non-trivial situations where uncertainties regarding the future behavior of the system or its environment exist. It is shown by analytical considerations that optimal control is successful only in limited and restricted circumstances and, more so, that the introduction of optimal control can deteriorate rather than improve the over-all system performance. Some criteria are suggested upon which a decision can be based regarding an optimal control mode. A number of numerical examples are presented in order to indicate the regions in uncertainty space where the optimal control is successful and the regions where the control considered as suboptimal is better than the so-called optimal control. (Author)

AD-281 941 Div. 30
(TISTM/MS) OTS price $4.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
EFFECTS OF THE DEEP-OCEAN ENVIRONMENT ON MATERIALS.
A progress rept.,
by Kenneth O. Gray. 30 July 62, 1v. incl. illus. table, 6 refs. (Technical note no. N-446)
Unclassified report

DESCRIPTORS: *Ocean bottom, *Underwater equipment, Materials, Tests, Test equipment, Oceanographical data, Sea water, Construction, Design.

A research program to determine what materials are suitable for use in the construction of deep-ocean structures and facilities is delineated. The program involves (1) the exposure of a wide variety of constructional materials in deep-ocean environments, and (2) the exposure of companion specimens in laboratory-simulated deep-ocean environments. A submersible test unit carrying 1318 specimens of 301 different materials was placed on the ocean floor on 29 Mar 1962 in 5300 feet of water for an exposure period of 6 months. Five additional units are proposed, one each for 12 and 24 months submersion at 6000 feet and one each for 6, 12, and 24 months submersion at 12,000 feet on the ocean floor. A system of medium sized (9-inch ID) pressure vessels capable of simulating various aspects of the deep-ocean environment, with a pressure range from zero to 20,000 psi, has been fabricated and will be in operation early in FY-63. A large (18-inch ID) pressure vessel with similar capabilities is under procurement and is expected to be in operation in FY-63. (Author)

AD-282 016 Div. 30, 8
(TISTB/AW) OTS price $2.25

Melpar, Inc., Falls Church, Va.
ELECTRONIC REALIZATION OF FUNCTIONAL NERVE NETS.
Final rept., Dec 60-Jan 62,
by E. B. Carne. June 62, 80p. incl. illus. tables.
(Contract AF 33(616)7834, Proj. 4160)
(ASD TDR 62-266) Unclassified report

DESCRIPTORS: *Computer logic, *Electrical networks, *Circuits, Learning, Sequences, Switching circuits, Trigger circuits, Operation, Maintenance, Decision making, Electric servomechanisms, Simulation, Nerves, Eye, Computer logic.

The self-organizing Binary Logical Network, a learning system using the reinforcement principle, is developed and used to formulate models of neurological subsystems. One of these systems, a maze running vehicle, has been constructed as an experimental and demonstration device. A detailed description of the maze system is provided. (Author)

AD-282 042 Div. 30
(TISTP/JW) OTS price $4.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
PROGRAMMING FOR THE GROUP 33 ANALOG-TO-DIGITAL CONVERSION SYSTEM,
by R. P. Ingalls and W. C. Mason. 9 July 62, 47p. incl. illus. tables (Rept. no. 33G-1)
(Contract AF 19(628)500)
(AFESD TDR 62-109) Unclassified report

DESCRIPTORS: *Analog-to-digital converters, *Programming, Data processing systems, Data storage systems, Computer logic.

The Group 33 analog-to-digital conversion system makes possible the computer analysis of real time or stored analog data having a large range of characteristics. The use of the conversion system is described briefly and its characteristics and limitations indicated. A number of subroutines have been written to handle the magnetic tapes written by the conversion system on the IBM 709 or 7090 Electronic Data Processing Machines with FORTRAN programs. The subroutines and sample programs using them are described. (Author)

AD-282 063 Div. 30
(TISTW/RD) OTS price $3.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
100 KCPS MODULATION PARAMAGNETIC SPECTROMETERS FOR CENTIMETER AND MILLIMETER WAVELENGTHS,
by W. H. From and E. D. Mills. 26 Apr 62, 27p. incl. illus. 7 refs. (Rept. no. 82G-1)
(Contract AF 19(604)7400)
(AFESD TDR 62-106) Unclassified report

DESCRIPTORS: *Radiofrequency spectrum analyzers, Low frequency, Paramagnetic resonance, Sensitivity, Klystrons, Electronic circuits, Magnetic fields, Modulation.

The prime requisites of paramagnetic resonance spectrometers for use in studying paramagnetic samples over large frequency regions of the microwave spectrum are sensitivity, flexibility, and simplicity. The 100 Kcps magnetic field modulation spectrometer described satisfies these requirements most effectively. Spectrometer sensitivity, its attendant problems, and some solutions are reviewed. (Author)

AD-282 142 Div. 30, 32
(TISTB/AW) OTS price $2.60

International Business Machines Corp., Yorktown Heights, N. Y.
A BUSINESS GAME FOR TEACHING AND RESEARCH PURPOSES. PART I. A GENERAL DESCRIPTION OF THE GAME,
by Richard Levitan and Martin Shubik.
17 July 62, 24p. incl. illus. 2 refs. (Research rept. no. RC-730)
(Contract Nonr-377500, Proj. NR 047-040)
Unclassified report

DESCRIPTORS: *Training devices, Games theory, Digital computers, Design, Education, Economics.

The construction and analysis of an oligopolistic market, together with the design of a business game for teaching and research purposes based on this market, are presented. The second paper in this series (AD-282 143) contains a detailed description of the market structure, together with an analysis of three solution concepts; this paper contains an over-all description of the game, together with input and output formats and displays of the graphical and analysis returns. (Author)

AD-282 143 Div. 30, 32
(TISTB/AW) OTS price $3.60

International Business Machines Corp., Yorktown Heights, N. Y.
A BUSINESS GAME FOR TEACHING AND RESEARCH PURPOSES. PART IIA. THEORY AND MATHEMATICAL STRUCTURE OF THE GAME,
by Richard Levitan and Martin Shubik.
17 July 62, 27p. incl. illus. 4 refs. (Research rept. no. RC-731)
(Contract Nonr-377500, Proj. NR-047-040)
Unclassified report

DESCRIPTORS: *Training devices, Games theory, Design, Education, Analysis, Costs, Functions, Economics.

The construction and analysis of an oligopolistic market, together with the design of a business game for teaching and research purposes based on this market, are presented. The first paper in this series (AD-282 142) contains an over-all description of the game; this paper contains a detailed description of the market structure, together with an analysis of three solution concepts. (Author)

AD-282 151 Div. 30
(TISTP/WH) OTS price $2.60

Naval Ordnance Test Station, China Lake, Calif.
THE NODAC REDACTOR: A GENERAL SYSTEM DESCRIPTION,
by Howard J. Hirschy. July 62, 22p. incl. illus. (NOTS TP 2995)
Unclassified report

DESCRIPTORS: *Digital computers, *Computer logic, *Data processing systems.

The Redactor is a general-purpose, open-ended data processor. Its primary function is to reduce noncomputer-compatible information into a form which a large digital computer can use. In addition, it provides a means of furnishing a nonstandard computer output. Because the system was designed to be as general-purpose as possible, the Redactor has been applied with comparative ease to many data processing programs in the past and it is anticipated that this feature of adaptability will keep the equipment useful for some time to come. This analysis presents a general description of the equipment, capabilities, and design philosophy of the Redactor system. (Author)

AD-282 152 Div. 30
(TISTP/WH) OTS price $1.60

Naval Research Lab., Washington, D. C.
THE ELECTRICAL CALORIMETER AS AN INTEGRATING DEVICE,
by W. A. Von Wald, Jr. and J. E. Dinger.
12 July 62, 10p. incl. illus. tables (NRL rept. no. 5796)
Unclassified report

DESCRIPTORS: *Calorimeters, *Electrical equipment, *Ocean waves, *Statistical analysis, *Transducers, Thermodynamics, Telemetering systems.

The immediate interest in an electrical calorimeter was in its data averaging feature. Studies with experimental calorimeters designed for use with wave sensors in measuring the average energy of ocean waves indicate that measurement intervals even longer than the desired 20 minutes can be achieved. The fact that the readout is a direct measure of the average of the mean square of the input signal (over an interval of time) makes the basic calorimeter readily applicable to the telemetry of ocean-wave measurements for which it was developed. By substituting thermistors, which do not have a linear response to input power, for the wire windings or by the incorporation of the calorimeter into a more sophisticated calorimeter circuit, mathematical processes other than squaring and integrating are possible. (Author)

AD-282 170 Div. 30, 15
(TISTP/GRW) OTS price $10.50

Sylvania Electric Products, Inc., Waltham, Mass.
DYNAMIC PROGRAMMING TECHNIQUES.
Final rept.
20 May 62, 133p. incl. illus. refs.
(Contract AF 30(602)2421)
(RADC TDR 62-285) Unclassified report

DESCRIPTORS: *Linear programming, *Operations research, Statistical analysis, Mathematical logic, Scheduling.

Contents:
Theoretical structure
The structure of dynamic programming
The foundations of stochastic programming
Representation theory in stochastic programming
Illustrative applications of stochastic and dynamic programming
The optimum location of checking stations
System performance analysis
Optimum allocation of resources
Recursive methods, dynamic programming and invariant imbedding
The multinomial coefficients
A simple neutron transport model
Continuous optimization problems of the calculus variations
The representation of stochastic processes
The solution of allocation problems with concave return functions
On the optimum location checking stations

AD-282 223 Div. 30, 27
(TISTM/ODN) OTS price $4.60

Ohio State U. Research Foundation, Columbus.
X-RAY IMAGE SYSTEM FOR NONDESTRUCTIVE TESTING OF SOLID PROPELLANT MISSILE CASE WALLS AND WELDMENTS.
Quarterly progress rept. no. 3, 21 Dec 61-20 Mar 62,
by Robert C. McMaster, Jay P. Mitchell, and Merle L. Rhoten. 20 Mar 62, 50p. incl. illus. 9 refs.
(Contract DA 33-019-ORD-3383, Proj. 5B93-32-004)
(WAL TR 142.5/1-3) Unclassified report

DESCRIPTORS: *Non-destructive testing, *Rocket cases, *Television cameras, *Camera tubes, X rays, X-ray photography, Welds, Welded joints, Thin films, Wire, Glass, Beryllium, Memory devices, Thickness, Aluminum, Steel, Circuits, Tungsten wire, Selenium, Targets.

A television X-ray image enlargement system was developed for in-motion examination of missile case materials and weldments. Imaging tests of steel materials indicate that a 2% penetrameter contrast sensitivity can be obtained up to 1/4-inch thickness with 1/1000-inch detail resolution. Resolution tests indicate that wire diameters down to 5/10,000-inch can be visualized on the monitor screen. Comparative signal response evaluation tests of glass-window television camera tubes have been made with 150, 220, and 300 kv X-ray sources. The data indicate similar responses to the 220 and 300 kv sources. Comparative data taken at 100 kv with the 150 kv Be-window and 220 kv glass-window X-ray sources indicate that signal response is greater to the 220 kv glass-window X-ray source. Evaluation tests of an image memory camera tube indicate that it is sensitive to X-radiation and can store X-ray images up to 10 minutes. Imaging tests with 1/2-inch thick Al specimens indicate that 2% penetrameter contrast sensitivity can be observed. A gamma amplifier was constructed to improve the contrast range of the television image. (Author)

AD-282 358 Div. 30
(TISTM/EJH) OTS price $6.60

American Radiator and Standard Sanitary Corp., Mountain View, Calif.
FEASIBILITY INVESTIGATION AND DEVELOPMENT OF 2000 C RESISTANCE TEMPERATURE SENSOR.
Final rept. May 61-Mar 62 on Phase 2, Investigation of the Feasibility of a 500 to 2000 C Solid Resistance-Type Sensor,
by J. T. Chambers. 31 July 62, 57p. incl. illus. tables, 10 refs. (Rept. no. ATL-D-757)
(Contract AF 33(616)8263, Proj. 8224)
(ASD TDR 62-417)
Unclassified report

DESCRIPTORS: *Resistance thermometers, *Temperature sensitive elements, Iridium, Thermometers, High temperature research, Yttrium compounds, Oxides, Design, Sensitivity, Calibration, Resistance, Shock resistance, Stability, Oxygen, Solids, Radiation effects, Wire.

The practical feasibility of developing a resistance thermometer, composed of an Ir resistance element mounted in Y2O3, for measuring temperatures in solids in the range 500 to 2000 C in an oxidizing environment was investigated. A sensor design was evolved that embodies a flat grid of 10 inches of 3-mil Ir wire with 10-mil Ir leads. This sensing element is cast in Y2O3 under pressure, and the sensor is consolidated by high-temperature sintering. It was concluded that a resistance thermometer of Ir mounted in Y2O3 is feasible to at least 1400 C. It is probable that the range can be extended to 2000 C by improving controls on the purity of the oxides used with the Ir wire. Recommendations are made for continued development and testing. (Author)

AD-282 361 Div. 30, 15, 26
(TISTP/WH) OTS price $6.60

Columbia U. School of Engineering, New York.
CONTRIBUTIONS TO THE THEORY OF TIME-OPTIMAL CONTROL,
by Eliezer Kreindler. 1 May 62, 59p. incl. illus. 26 refs. (Technical rept. no. 76; CU-10-62-AF-998-EE)
(Contract AF 49(638)998, Proj. 9768)
(AFOSR-2840) Unclassified report

DESCRIPTORS: *Control systems, *Automation, Functional analysis, Matrix algebra, Integration.

A unified theory for the time-optimal control of general linear, not necessarily normal (a restriction usually imposed) plants, with generalized constraints on the control variable is developed. The approach is geometrical, thereby providing new insight and interpretation for some results obtained by methods of functional analysis. Some other known results are generalized and, as a rule, derived in a simpler fashion. The special cases of amplitude, energy, and area constraints are studied in detail, clarifying some points that remained hitherto obscure. An approximate synthesis procedure is proposed and an example is analyzed. (Author)

AD-282 363 Div. 30, 15
(TISTP/WH) OTS price $6.60

Dikewood Corp., Albuquerque, N. Mex.
GENERATION AND TESTING OF HYPOTHESES.
Final rept.,
by F. H. Jean. 29 May 62, 62p. incl. illus. tables, 11 refs. (Rept. no. FR-1021)
(Contract AF 30(602)2514, Proj. 5581)
(RADC TDR 62-295) Unclassified report

DESCRIPTORS: *Probability, *Groups (Mathematics), *Computers, *Learning, Sequential analysis.

Theories and experiments concerning the generation and testing of hypotheses are described. The theories and experiments are abstract but suggestions for application to more realistic situations are given. The study is based primarily on the search for order in the information or data observed. Most of the report is concerned with two subjects. The first of these is a theory of inductive inference that does not require exhaustive enumeration of hypotheses. The second is computer experiments that generate hypotheses on the basis of simple objects and relationships that are observed. (Author)

AD-282 395 Div. 30
(TISTW/PCR) OTS price $13.00

Inter-Range Instrumentation Group, White Sands Missile Range, N. Mex.
INSTRUMENTATION TIMING SYSTEMS BROCHURE.
Rev. May 61, 183p. incl. illus. table (IRIG Document no. 103-59)
Unclassified report

DESCRIPTORS: *Time interval counters, *Time signals, *Test facilities, Instrumentation, Guided missile research.

Information is presented about the instrumentation timing systems currently in use at the (1) Atlantic Missile Range, (2) Pacific Missile Range, (3) White Sands Missile Range, (4) Air Force Flight Test Center, (5) Air Proving Ground Center, (6) Naval Ordnance Test Station, and (7) Tonopah Test Range. A glossary of the IRIG signal timing terms is also included.

AD-282 476 Div. 30
(TISTB/CCH) OTS price $7.60

North American Aviation, Inc., Downey, Calif.
DIGITAL CONTROL SYSTEMS. A SELECTIVE BIBLIOGRAPHY.
17 July 62, 71p. (Rept. no. SID 62-923)
Unclassified report

DESCRIPTORS: *Bibliography, *Digital computers, Industrial production, Errors, Control systems.

This bibliographic search surveys the recent literature on Digital Control Systems. Included are 262 items with special emphasis on Z-Transform, Error Analysis and Sample-Data Systems. (Author)

AD-282 503 Div. 30, 15
(TISTP/JW) OTS price $5.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
CONTINUOUS SAMPLING PLANS UNDER DESTRUCTIVE TESTING,
by Frederick S. Hillier. 9 July 62, 55p. incl. table, 5 refs. (Technical rept. no. 60)
(Contract Nonr-22553, Proj. NR 042-002)
Unclassified report

DESCRIPTORS: *Quality control, *Test methods, Sampling, Analysis of variance, Reliability, Production.

The formulation presented explicitly takes into account the possibility that the process quality may deteriorate to an undesirable level. It uses certain a priori information about the relative likelihood of the possible patterns of process quality over time. The resulting continuous sampling scheme is designed to approximate the procedure which would minimize the total expected cost and imputed cost, including the expected cost of inspection, the expected cost and imputed cost of clearing defective items for use, and the expected cost and imputed cost of investigating and adjusting the process to improve the process quality. Determinations are made as to when the process should be adjusted if no inspections are permitted to supplement the a priori information and when the additional information on the process quality level to be obtained from inspection justifies the additional cost of inspection. The continuous sampling plan arising out of the analysis is summarized and the resulting operating characteristics are illustrated. (Author)

AD-282 518 Div. 30
(TISTA/GEC) OTS price $19.75

Bendix Corp., Southfield, Mich.
STUDY OF INSTRUMENTATION FOR A SPACE SIMULATION CHAMBER,
by H. R. Farrah, R. A. Fluegge and others.
Aug 62, 336p. incl. illus. tables.
(Contract AF 40(600)955, Proj. 7778)
(AEDC TDR 62-161) Unclassified report

DESCRIPTORS: *Space environmental conditions, *Test facilities, Vacuum systems, Altitude chambers, High altitude, Measurement, Temperature, Cryogenics, Gases, Pressure, Solar energy, Density, Reliability, Radiation effects, Instrumentation, Simulation.

A study was made of the instrumentation and data collection of pertinent parameters in a large ultrahigh vacuum aerospace chamber. Existing techniques for the measurement of cryogenic temperature, residual gas pressure, solar and planetary radiation, composition, and density were evaluated. Methods of modifying, designing, or developing sensing devices to make them suitable for use in an aerospace chamber were studied. (Author)

AD-282 524 Div. 30, 15
(TISTP/WH) OTS price $.50

Diamond Ordnance Fuze Labs., Washington, D. C.
MULTIPLE INTEGRATIONS ON A REAL-TIME ANALOG COMPUTER,
by Arthur Hausner. 30 July 62, 28p. incl. illus. 3 refs. (DOFL rept. no. TR-1046)
(Proj. DA-5N06-01-014)
Unclassified report

DESCRIPTORS: *Analog computers, *Functional analysis, *Integration, Integral equations, Computer logic.

Identifiers: Computer mechanization.

Techniques are presented for evaluating integrals of the type on a real-time analog computer.

$$I = \int_a^b \int_{y_1(x)}^{y_2(x)} f(x,y)\, dydx$$

Extensions to higher order integrals are made and other uses of these techniques are discussed. The emphasis is placed on using components generally available in real-time computers. However, the formulas derived suggest that the use of the techniques presented are preferable even when a repetitive computer with memory is available. (Author)

AD-282 525 Div. 30
(TISTW/RD) OTS price $3.60

Diamond Ordnance Fuze Labs., Washington, D. C.
AUTOMATIC TESTING SYSTEM,
by Morris Brenner. 25 July 62, 42p. incl. illus. tables (DOFL rept. no. TR-1064)
Unclassified report

DESCRIPTORS: *Guided missile fuzes, *Test equipment, Test methods, Tests, Electromagnetic fuzes, Memory devices, Fuzes, Electronic equipment, Test equipment, Automatic.

A system for the automatic testing of electronic devices has been designed. It is applicable to the measurement of test parameters that are available as dc voltages or can be converted to dc voltage prior to injection into the system. It memorizes n parameters simultaneously and then records them sequentially on IBM cards or tape. (A prototype for 10 parameters has been constructed.) Voltage comparators indicate the relation

of the test data being recorded to specification requirements by lighting of the appropriate lamp to show go, high, or low. As a universal-type testing device for both R&D and production it offers significant advantages with respect to accuracy, reliability, costs, and efficient utilization of test personnel. The system, with the exception of the specially built memory circuitry, can be assembled from commercially available equipment. Operation has been checked out against static sources such as battery-operated voltage dividers and active sources such as guided missile fuzes with satisfactory results. (Author)

AD-282 549 Div. 30, 15
(TISTP/WH) OTS price $4.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
MACHINE LEARNING PROCESSES APPLIED TO PATTERN RECOGNITION.
Final rept.,
by Arthur E. Laemmel. 14 Dec 61, 39p. incl. illus. 31 refs. (Rept. no. PIBMRI-981-61)
(Contract AF 19(604)6154)
(AFCRL 62-6) Unclassified report

DESCRIPTORS: *Machine learning, *Classification, *Digital computers.

The theory of the principal methods for pattern recognition is summarized. Emphasis is on the division of the whole process into three phases: calibration from a sample set of patterns, derivation of numerical properties, and a decision process for determining the class of a pattern. Several mathematical processes are suggested for finding useful properties, including equations which define invariants to acceptable distortions. It is shown that if an efficient and consistant decision process is used, then the property search is easier since the addition of useless or redundant properties cannot degrade the performance. (Author)

AD-282 613 Div. 30, 25
(TISTP/TL) OTS price $3.60

Stanford Research Inst., Menlo Park, Calif.
GRAPHICAL DATA PROCESSING RESEARCH STUDY AND EXPERIMENTAL INVESTIGATION.
Quarterly progress rept. no. 8, 1 Mar-31 May 62,
by A. E. Brain and N. J. Nilsson. June 62, 24p. incl. illus. 5 refs. (Rept. no. 8)
(Contract DA 36-039-sc-78343)
Unclassified report

DESCRIPTORS: *Data processing systems, *Optical systems, *Feasibility studies, *Data storage systems, Design, Identification systems, Programming, Simulation, Selection, Optics, Image tubes, Sampling, Photoelectric cells, Photoconductivity, Diodes, Transistors, Photomultipliers, Measurement, Simulation.

The objective of this project is to conduct a research study and experimental investigation of techniques and equipment characteristics suitable for practical application to nonalphanumeric graphical data processing for military requirements. All phases of the graphical data processing art will be considered, including the treatment of raw graphical data, identification, programming, selection, indexing, access to storage, and presentation. The studies and demonstrations of feasibility will be designed to evaluate the practicability of the proposed techniques and systems, with sufficient detail to be useful in establishing the design criteria necessary for equipment procurement. The program of work will consist of: (1) the study and development of organizations of combined fixed and adaptive networks that will permit recognition of patterns independent of size, displacement, and rotation; in the presence of interfering signals and noise; and on a real-time basis; (2) the development of components and subsystems suitable for implementing the schemes devised; and (3) the design and construction of an experimental Graphical Data Processing Machine making use of the techniques and components found to be most practicable by investigations. (Author)

AD-282 625 Div. 30, 14
(TISTM/PCR) OTS price $6.60

Westinghouse Electric Corp., East Pittsburgh, Pa.
ANALYTICAL AND EXPERIMENTAL STUDY OF ADAPTING BEARINGS FOR USE IN AN ULTRA-HIGH VACUUM ENVIRONMENT. PHASE IV. SCREENING OF DRY LUBRICANTS FOR USE IN HIGHLY LOADED LOW-SPEED BEARINGS AND GEARS,
by P. H. Bowen. Aug 62, 34p. incl. illus. tables.
(Contract AF 40(600)915)
(AEDC TDR 62-163) Unclassified report

DESCRIPTORS: *Space environmental conditions, *Vacuum systems, Bearings, Gears, Composite materials, Plastics, High temperature research, Bronze, Silver, Copper, Controlled atmospheres, Nitrogen, Powders, Mixtures, Selenides, Tungsten, Friction, Ball bearings, Lubricants.

This report includes:
ANALYTICAL AND EXPERIMENTAL STUDY OF ADAPTING BEARINGS FOR USE IN AN ULTRA-HIGH VACUUM ENVIRONMENT. PHASE V. OUTGASSING DETERMINATION OF SELF-LUBRICATING COMPOSITES AND PLASTICS,
by P. H. Bowen. Aug 62, 22p. incl. illus. tables (Rept. no. AEDC TDR 62-163)

The outgassing characteristics of 16 composites and one experimental plastic material were studied in a vacuum at a pressure of 10 to the minus 8th power torr following a 16 to 19-hour degassing period in a vacuum at a pressure of 10 to the minus 6th power torr, to determine the amount and composition of gases evolved at various temperatures. Results show that most of the materials were more suitable than was generally believed for use in a vacuum at temperatures of 360 and 560 F. The composites containing Ag exhibited satisfactory outgassing rates at the lower temperature and were more stable than the bronze and Cu composites at the higher temperatures. The wear and friction characteristics of 96 self-lubricating composites were studied in air at a sliding velocity of 47 fpm and under loads from 530 to 1400 psi. Ten self-lubricating compositions were studied in a dry nitrogen environment. (Author)

AD-282 658 Div. 30, 4, 10
(TISTP/WH) OTS price $7.60

Aerospace Corp., El Segundo, Calif.
THE AEROSPACE CORPORATION COMPUTER PROGRAMS FOR THE SOLUTION OF MULTIELEMENT CHEMICAL EQUILIBRIA,
by S. A. Greene and H. J. Vale. 28 June 62, 69p. incl. illus. tables (Rept. no. TDR-69(2240-51)TR-2)
(Contract AF 04(695)69)
(DCAS TDR 62-138) Unclassified report

DESCRIPTORS: *Digital computers, *Programming, *Combustion, *Chemical equilibrium, Synthesis, Flames, Combustion chamber gases, Nitrogen, Oxygen, Beryllium compounds, Oxides, Ethyl radicals, Fluorides, Chloryl radicals, Nitrogen compounds, Ammonium radicals, Perchlorates, Fuel additives, Beryllium, Rocket fuels, Rocket oxidizers, Hydrogen, Aluminum compounds, Hydrides, Chemical reactions, Heat of formation, Thermodynamics, Velocity, Stability, Pressure, Temperature, Metals, Theory.

Work was completed on a generalized method for the analytical solution of complex multielement chemical equilibria under all conditions of pressure, temperature, and mass balance. The programs are written for the IBM 7090 and use a unique technique of majors and minors to guarantee automatic convergence. Variations of the basic solution method are applied to problems in chemical synthesis, thermal stability, and chemical compatibility. The programs are also used to obtain theoretical rocket propellant performance and Mollier diagrams. (Author)

AD-282 664 Div. 30, 12
(TISTW/PCR) OTS price $8.60

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
MULTISYSTEM TEST EQUIPMENT PROGRAM. FRANKFORD ARSENAL TASKS.
Quarterly technical rept. no. 1, 1 Apr-30 June 62,
by A. Chaflin. 20 Aug 62, 89p. incl. illus. tables (Memo. rept. no. M63-11-1; Rept. no. SMUFA-1110)
Unclassified report

DESCRIPTORS: *Computers, *Digital computers, Switching circuits, Memory devices, Digital systems, Noise, Circuits, Ground support equipment, Test equipment, Magnetic tape, Radar analysis, Test methods, Coding, Guided missiles, Storage, Programming.

Progress on the Frankford Arsenal Multisystem Test Equipment program is presented. Nine specific areas are discussed on an individual basis. Particular emphasis is given to Frankford Arsenal technical supervision, bulk memory study, input-output buffer and compiler program. (Author)

AD-282 667 Div. 30, 12
(TISTP/WH) OTS price $11.50

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
A PROGRAM FOR THE COMPUTATION OF THE ORBIT OF AN EARTH SATELLITE.
Final rept.,
by E. L. Davis, Jr. and James G. Stein. July 62, 149p. incl. tables, 5 refs.
(Contract AF 19(604)8837)
(ESD TDR 62-208) Unclassified report

DESCRIPTORS: *Satellite vehicle trajectories, *Digital computers, *Programming, *Celestial mechanics, Gravity, Numerical methods and procedures.

This report contains the pre-assembly listing of two earth satellite orbit computing programs: one written for the Burroughs 220 Computer and one written for the Philco 2000 Computer. The computational procedure is one based on Vinti's Method. In this method, the earth's gravitational potential is expressed in oblate spheroidal coordinates, which permits the separation of the Hamilton-Jacobi equation. A differential correction procedure is included. (Author)

AD-282 679 Div. 30
(TISTP/TL) OTS price $8.10

Electronic Systems Lab., Mass Inst. of Tech., Cambridge.
INVESTIGATIONS IN COMPUTER-AIDED DESIGN FOR NUMERICALLY CONTROLLED PRODUCTION.
Interim technical progress rept. nos. 3 and 4, 1 Mar 61-28 Feb 62 on Integration of Design Data into Numerical Control,
by D. T. Ross, S. A. Coons and others. May 62, 76p. incl. illus. (Rept. no. ESL-IR-138)
(Contract AF 33(600)42859)
(ASD TR 7-820(IR 3 and 4) Unclassified report

DESCRIPTORS: *Data processing systems, *Automatic, *Programming, Machine tools, Design, Mechanical engineering, Numerical analysis, Computers, Integration, Instrumentation, Oscilloscopes, Stresses, Analysis, Operators (Mathematics), Display systems.

The computer-aided design project is engaged in a program of research into the application of the concepts and techniques of modern data processing to the design of mechanical parts, and the further development of automatic programming (APT) systems for numerically controlled machine tools. This combined Interim Report covers the fifteenth through twenty-sixth months of the project. Topics covered include: a description of current status on the basic bootstrap compiler, the available programs of the bootstrap plateau system, and the multi-pass compiler; discussion of a new first-pass algorithm which is believed to have wide applicability to all forms of problem statement; descriptions of three manual intervention console designs--a rudimentary version now operating on the 709 computer, a proposed version for the 709, and a study of a remote console for a large-scale central computer; computer studies in three-dimensional shape description and stress analysis; and plans for pilot studies in pin-jointed trusses and sculptured parts. (Author)

AD-282 684 Div. 30
(TISTW/RD) OTS price $2.60

Stanford Research Inst., Menlo Park, Calif.
RESEARCH ON DISPLACEMENT GAGES. MECHANICAL PENDULUM GAGE.
Technical memo.,
by E. G. Chilton. June 61, 24p. incl. illus. ref. (Rept. no. 2874-TM-4)
(Contract DA 49-146-XZ-012)
Unclassified report

DESCRIPTORS: *Gages, *Underground explosions, *Seismographs, Measurement, Earth, Liquid level gages, Errors, Analysis, Calibration, Tests, Instrumentation.

For evaluation of the effects of nuclear or chemical explosions underground, the horizontal and vertical displacement of the ground nearby needs to be measured. Integration of accelerometer or velocity gage records is unsatisfactory, and direct displacement measurement is desired. The aperiodic gages developed earlier give an output directly proportional to displacement, but had certain major operational drawbacks. These have been eliminated by changing to long period seismic gages--though at the cost of the convenience of direct proportionality between output and displacement. Tests of a prototype of this type of gage show errors of less than 10% full range for periods of operation up to 2 secs. Calibration procedures and a numerical method for converting the output to displacement are given in detail. (Author)

# Division 30 - RESEARCH AND RESEARCH EQUIPMENT

AD-282 685 Div. 30
(TISTW/RD) OTS price $8.60

Stanford Research Inst., Menlo Park, Calif.
DEVELOPMENT OF SOIL DISPLACEMENT AND STRAIN GAGES.
Final rept.,
by L. M. Swift. Sep 61, 89p. incl. illus.
4 refs.
(Contract DA 49-146-XZ-012)
(DASA-1267) Unclassified report

DESCRIPTORS: *Strain gages, Nuclear explosions, Earth, Gages, Measurement, Liquid level control, Design, Calibration, Motion.

For evaluation of the effects of nuclear or chemical explosions, the horizontal and vertical transient displacements of the ground nearby or of certain structural elements need to be measured. Integration of accelerometer or velocity gage records is unsatisfactory for many purposes, and direct displacement measurement is desired. Similarly, improved devices for measuring earth strain from large explosions are desired. Of the several displacement gages considered, the design consisting of a geared compound pendulum was found optimum for most applications. This design was first used and tested as an aperiodic gage with considerable success, but it had operational drawbacks. These have been eliminated by changing to a long-period undamped periodic gage, at the cost of greater departure from direct proportionality between output and displacement. Numerical means for correcting gage records for gage characteristics have been devised, resulting in greater accuracy over longer periods than was practically feasible with the aperiodic gages. It was concluded that earth strain gages at depth should be grouted in place in relatively small holes, using a grout no less compliant than the formation. A strain gage was devised which is particularly adapted for installation on a wire line associated with other instruments. Means for avoiding errors caused by the presence of the wire line were devised. (Author)

AD-282 709 Div. 30, 16
(TISTW/RD) OTS price $2.60

Varo, Inc., Garland, Tex.
DEVELOPMENT OF A PHYSIOLOGICAL TELEMETRY SYSTEM FOR USE ON NON-HUMAN SUBJECTS,
Final rept., 29 June 61-28 June 62,
by Frank J. Haahn. 28 June 62, 18p.
(Contract DA 18-108-cml-6647)
Unclassified report

DESCRIPTORS: *Telemeter systems, Telemetering receivers, Automatic, Analog-to-digital converters, Respiration, Electroencephalography, Electrocardiography, Telemetering transmitters, Telemetering antennas, Frequency modulation, Physiology.

The tasks involved in the design and development of a multichannel physiological telemetry system which is intended for use on non-human subjects, but which may be used on humans if desired are discussed. The system is non-implantable and makes provision for the use of at least four test subjects on each of two receiving stations. The system is a time-shared, automatic/semi-automatic system which delivers to the input of a strip recorder or analog-to-digital converter, a varying direct current signal which represents the physiological functions of temperature, respiration, electrocardiogram, electromyogram and electroencephalogram. Battery power supply is included in the subject-carried package, and is of the non-rechargeable, mercury cell type. (Author)

AD-282 731 Div. 30
(TISTW/RD) OTS price $3.60

Armour Research Foundation, Chicago, Ill.
INSTRUMENTATION AND MEASUREMENT TECHNIQUES STUDY.
Quarterly progress rept. no. 13, 1 Feb-30 Apr 62,
by A. T. Ashby. 30 Apr 62, 31p. incl. illus. tables (Rept. no. ARF 5112-39)
(Contract DA 36-039-sc-78269, Proj. 3G89-01-021-01)
Unclassified report

DESCRIPTORS: *Measurement, *Instrumentation, Electronic equipment, Military equipment, Printed circuits, Distortion, Impedance, Sidebands, Phase shifters, Modulators, Field wire communication systems, Electrical equipment, Test equipment.

A current probe for use with printed circuitry which senses branch currents in parallel circuits and displays the angle and magnitude of the impedance across which a 159 Kc voltage is impressed is described. The present breadboard version also allows use of a Hewlett-Packard type clamp-around current probe to perform similar measurements where the conductors are wires. The location of faults on loaded spiral-four cable by means of a phase measurement technique is evaluated experimentally. Agreement with predicted results is sufficient to yield results accurate to about 10%, for faults up to 15 mi. Taking into account all apparent sources of error, it is anticipated that the technique could be implemented to provide accurate measurements within 5% out to 20 miles. Distortion product reduction techniques for single sideband for linear amplifiers are discussed, with especial emphasis on the location of the zero signal operating point as a means of achieving a minimum signal-to-distortion ratio. (Author)

AD-282 799 Div. 30, 2
(TISTP/GRW) OTS price $15.00

Wolf Research and Development Corp., Boston, Mass.
A SURFACE FITTING OBJECTIVE ANALYSIS PROGRAM.
Final rept.,
by Stephen Jones, Sherman Shriber and others.
June 62, 215p. incl. illus.
(Contract AF 19(604)7318, Proj. 8642)
(AFCRL 62-653) Unclassified report

DESCRIPTORS: *Weather forecasting, *Programming, Weather stations, Least squares method, Data storage systems, Data processing systems, Punched card methods.

The purpose of this program is to calculate the value of weather variables at specific grid points based upon observations from nearby stations. These estimates are obtained by fitting a plane or a quadratic surface to the observations by a least squares procedure. Two basic options are (1) an analysis at grid points, and (2) an analysis at weather stations. A surface is fitted to observations reported by eight weather stations by the least squares procedure. From this surface a value is calculated at a specific grid point. For research purposes an analysis at a weather station is employed. In this case, the value of the weather variable observed at the station is temporarily ignored, and the values from nearby stations determine the fit of the surface. From this surface, a value is calculated at the station in question, and the actual observation at this station is used as a verification value. The difference between

the observed value and the calculated value is the error. This procedure is repeated for each station, and from this the root-mean-square error is calculated. (Author)

AD-282 830 Div. 30, 17, 13
(TISTM/GEC) OTS price $1.60

Bureau of Reclamation, Denver, Colo.
COMPUTATION OF STRESSES IN REINFORCEMENT STEEL AND PENSTOCK LINERS.
Rept. on Electronic Computer Program Description no. S-100.
June 60, 7p. illus.
Unclassified report

DESCRIPTORS: *Reinforcing steel, *Dams, *Metal plates, Stresses, Programming, Elasticity, Computers, Strain gages.

In concrete dams constructed by the Bureau of Reclamation, many strain meters are attached to reinforcement steel and penstock liners embedded in the concrete. Readings of these meters are taken frequently over a period of years. These field data are then reduced to give values of stress developed in the steel and liners. This involves a simple computation, but hundreds of meter readings must be reduced. The present program has been prepared to perform these computations. (Author)

AD-282 838 Div. 30, 14
(TISTA/SEB) OTS price $.75

Directorate of Materials and Processes, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
AN AUTOMATIC RECORDING DILATOMETER FOR THERMAL EXPANSION MEASUREMENTS TO 2000 F.
Final rept. for Nov 60-Dec 61 on Materials Application,
by Gary L. Denman. May 62, 19p. incl. illus. 10 refs.
(Proj. 7381)
(ASD TDR 62-315) Unclassified report

DESCRIPTORS: *Dilatometers, *Thermal expansion, Automatic, High temperature research, Test equipment, Materials, Quartz, Errors, Measurement, Design, Tests.

The design, construction, and calibration of an automatic recording dilatometer capable of accurately measuring thermal expansion properties of solid materials from room temperature to 2000 F is discussed. The dilatometer was of the quartz-tube differential expansion type with auxiliary equipment capable of continuous and automatic recording of thermal expansion data. A statistical error analysis is included which indicates that an accuracy of ±1% can be obtained with the instrument. (Author)

AD-282 900 Div. 30, 9
(TISTA/SEB) OTS price $4.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
ABNORMAL AERODYNAMIC CONDITIONS WITHIN THE PWT SUPERSONIC TUNNEL COMPRESSOR AND THEIR EFFECTS ON ITS DYNAMIC CHARACTERISTICS,
by R. A. Robinson. Aug 62, 42p. incl. illus. 4 refs. (Rept. no. AEDC TDR 62-156)
(Contract AF 40(600)1000)
Unclassified report

DESCRIPTORS: *Supersonic wind tunnels, *Axial-flow compressors, Supersonics, Stresses, Aerodynamics, Stalling, Wakes, Dynamics, Axial-flow compressor blades, Supersonic flow.

During the initial shakedown and calibration of the compressor of the PWT 16-Ft Supersonic Tunnel, several abnormal aerodynamic conditions occurred within the compressor. Turbining, abnormal wakes, stalls, and surges occurred. Records of these conditions show their effect on the dynamic characteristics of the compressor. The results indicate that all four conditions cause marked departures from the normal dynamic characteristics. Stalls and surges had the greatest effects on all the measured quantities. Several different types of stalls and surges were observed and recorded. Stalls without surges; surges with rotating stalls only; surges with a complete flow breakdown and reversal, which was the most frequent type; and mixtures of surges and stalls were encountered. The effects of stator blade angle, number of stages, pressure level, and compressor speed were recorded. All stalls and surges produced definite dynamic patterns. The type of pattern depended on the type of stall or surge. Turbining caused large changes in both static and dynamic stresses of the stator blades. Abnormal wakes from single stator blades caused large changes in both stator and rotor blade vibratory stresses. (Author)

AD-282 928 Div. 30, 9
(TISTA/VGW) OTS price $2.60

Stanford U., Calif.
A TWO-COLOR PYROMETER FOR THE MEASUREMENT OF TEMPERATURE AND CONTAMINATION LEVEL IN A SPARK-HEATED HYPERVELOCITY WIND TUNNEL,
by Walter Vali and R. Stephen de Voto. Aug 62, 25p. incl. illus. 8 refs.
(Contract AF 40(600)930, Proj. 8952)
(AEDC TDR 62-174) Unclassified report

DESCRIPTORS: *Hypersonic wind tunnels, *Pyrometers, Gas flow, Contamination, Particles, Temperature, Design, Calibration, Tests, Photomultipliers, Instrumentation.

A description is given of exploratory measurements, by means of a two-color pyrometers, of the temperature and concentration of solid contaminants near the throat of a spark-heated hypervelocity wind tunnel. Because of its rapid response, the method is capable of providing a time-resolved history of the contamination during a run. Although some initial success can be reported, additional work remains to be done before the method can be made reliably quantitative and before the temperature of the flowing gas can be related to that of the contaminants. (Author)

AD-282 931 Div. 30
(TISTP/WH) OTS price $3.50

National Aviation Facilities Experimental Center, Atlantic City, N. J.
TEST AND EVALUATION OF THE BI-DIRECTIONAL COMPUTER UPDATING EQUIPMENT (CUE).
Final rept. on Task 104-608V,
by E. L. McAfee, G. Jolitz and others. Feb 62, 1v. incl. illus. tables, 8 refs.
Unclassified report

DESCRIPTORS: *Computers, *Air traffic control systems.

Studies were made to determine if the computer

updating equipment met specifications, to investigate the operational advantages and disadvantages of the equipment, and to measure the loading effect it would have on an air traffic control automation system. The computer updating equipment tested consisted of a keyboard entry device, a visual display unit and associated electronic components necessary to interconnect with the UFC-1 automation system. The components met specifications in most particulars. Results of the operational evaluation proved the concept of computer updating to be feasible, and that the equipment could be operationally utilized with no additional workload on the part of the controller. The loading study indicated that the computer updating function would require approximately as much processing time as was required to perform flight plan processing and strip printing. (Author)

AD-282 937 Div. 30
(TISTW/DLW) OTS price $.50

Rock Island Arsenal Lab., Ill.
ELECTRICAL RESISTANCE CORROSION INDICATORS LITERATURE REPORT.
Technical rept.,
by Robert E. Johnson. 11 May 62, 14p. 11 refs.
(Rept. no. 62-1694)
(DA Proj. 593-21-062)
Unclassified report

DESCRIPTORS: *Corrosion, *Corrosion inhibition, Deterioration, Resistance, Thin films, Metal films, Sensitivity, Electrical properties, Contamination, Measurement, Test methods, Meters.

Research was reviewed to establish the degree of sensitivity of electrical resistance corrosion indicators and their applicability to the evaluation of corrosion-preventive oils and compounds. Laboratory work conducted under carefully controlled conditions indicated a high degree of sensitivity utilizing thin film indicators. Exposed specimens which exhibited no corrosion when examined visually provided small resistance changes of 1% to 5% by careful electrical measurements during the same period. Although each individual electrical indicator detected corrosion, variation in response or lack of reproducibility indicated an undesirable factor for use in field tests. The adaptation of the corrosometer, originally designed to utilize probe type specimens, to a glass slide having a thin metal film, provided a high degree of sensitivity. Satisfactory results could be obtained only after a thorough check of the electronic system and elimination of variables in the procedure. (Author)

AD-282 944 Div. 30
(TISTP/WH) OTS price $9.10

Melpar, Inc., Falls Church, Va.
INVESTIGATION AND FEASIBILITY STUDY OF GALLAGER CODE.
Final rept.
15 June 62, 1v. incl. illus. table.
(Contract AF 30(602)2587, Proj. 4519)
(RADC TDR 62-336) Unclassified report

DESCRIPTORS: *Digital computers, *Computer logic, *Errors, Parity.

The Gallager low-density parity-check code was investigated to establish its error-correction capabilities and to evolve economical decoder designs. Computer simulations produced experimental digit error rates for block-lengths ranging from 124 to 1008 and code rates between 1/4 and 2/3. Decoder output error rates were measured for a decision receiver with selected numbers of errors randomly distributed in a code block. Employing an approximate theory, this data was converted into expressions relating probability of error to SNR for coherent, incoherent, and Rayleigh-fading Gaussian channels. A likelihood receiver was simulated by drawing random samples from the distribution of likelihood ratios for coherent and Rayleigh-fading Gaussian channels. Digit error rates down to the region 1/1000 to 1/10,000 were measured as function of SNR. The dependence of error rate on two decoder parameters, the quantization accuracy and the number of iterations per block, was also investigated by computer simulation. (Author)

AD-282 986 Div. 30
(TISTP/WH) OTS price $9.10

Texas Instruments, Inc., Dallas.
FULL-DUPLEX DIGITAL VOCODER,
by Lawrence A. Yaggi, Jr. 11 June 62, 102p. incl. illus. tables, 36 refs. (Scientific rept. no. 1; SP14-A62)
(Contract AF 19(628)302, Proj. 4610)
(AFCRL 62-394) Unclassified report

DESCRIPTORS: *Digital systems, *Multiplex transmission, *Voice communication systems, *Speech representation, Coding.

The results of the design study phase for a variable-rate, full-duplex digital vocoder system are presented. The polymodal digital vocoder equipment provides the user with a choice of three primary modes of operation. These modes will consist of three digital transmission rates (1200, 2400, and 9600 bps) and three degrees of speech intelligibility, voice quality, and talker recognition. The 1200- and 2400-bps modes use conventional channel vocoder techniques, while the 9600-bps mode is a voice-excited vocoder technique. The performance goal of the voice-excited mode, as regards speech intelligibility, voice quality, and talker recognition, will exceed performance attained over conventional telephone toll circuits. Spectrum-normalization techniques used will provide more effective quantization of the spectrum data and allow fewer bits per second in specifying these data. Various optional modes of operation increase the flexibility of the system. A fully automatic means of obtaining bit and frame synchronization will be used. An all-digital technique of pitch pulse code modulation encoding/decoding provides rapid and accurate conversion of the pitch frequency information to digital data. A special analog-to-digital and digital-to-analog converter performs the ratio function for amplitude normalization. The analog-to-digital and digital-to-analog converters convert the data directly on a logarithmic scale. (Author)

AD-283 008 Div. 30
(TISTP/FR) OTS price $2.50

Curtiss-Wright Corp., East Paterson, N. J.
DEVELOPMENT OF AN AUTOMATIC MONITORING SYSTEM FOR FLIGHT SIMULATORS.
Final rept., Nov 59-Mar 61 on Training Equipment, Simulators, and Techniques for Air Force Systems, by A. T. Benenati, R. Hull and others. May 62, 102p. incl. illus.
(Contract AF 33(616)6891, Proj. 6114)
(MRL TDR 62-47) Unclassified report

DESCRIPTORS: *Flight simulators, *Data processing systems, Magnetic tape, Punched card methods, Memory devices, Magnetic cores, Computer logic, Digital computers, Programming.

The design study of an automatic monitoring system for flight simulators is presented. System basic functions are: (1) recording and playback, and (2) evaluation and scoring. The recording and playback facilities allow the recording of pertinent parameters of a simulated flight mission. The recording of any part or all of the mission can be played back into the flight simulator for re-enactment at any desired time. Objective evaluation and scoring of the trainee is accomplished by comparison of monitored parameters to the programmed criteria. Student errors in performance are printed by the device onto a cue sheet readily accessible to the instructor. Functional flexibility, the degree of automation required, size, and complexity of the simulator to be monitored are the factors that most affect the design. (Author)

AD-283 049 Div. 30, 14
(TISTW/RD) OTS price $1.10

Dynatech Corp., Cambridge, Mass.
THERMAL CONDUCTANCE APPARATUS.
Progress rept. no. 2,
by J. K. Sparrell. 15 Oct 61, 8p. incl. illus.
(Rept. no. 275)
(Contract AF 33(616)8099)
Unclassified report

DESCRIPTORS: *Honeycomb cores, *Ceramic materials, *Cermets, Heat resistant alloys, Instrumentation, Calibration, High temperature research, Thermal conductivity.

A thermal conductance apparatus has been designed, developed, and fabricated. The primary objective of this apparatus is to test honeycomb structures at elevated temperatures. A secondary objective is to test super-alloys, ceramics, and cermets. Operating conditions are as follows: Sample Temperature: 3000 F - approx 300 F; Heat Flux: 20,000 - 1000 Btu/hr sq. ft; Environment: Air, argon, 10 to the minus 5th power mm Hg vacuum; Sample Size: 12 in. x 12 in. x 3/8 in. to 2-1/2 in.; and Accuracy: 1800 F: ± 5%; 3000 F: ± 10%. (Author)

AD-283 099 Div. 30
(TISTP/FR) OTS price $2.75

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
THE FUNCTIONAL DESIGN OF A SPECIAL-PURPOSE DIGITAL COMPUTER FOR REAL-TIME FLIGHT SIMULATION.
Rept. for 1 May 61-30 Apr 62, on Training Equipment, Simulators, and Techniques for Air Force Systems,
by Louis M. Krasny. Apr 62, 124p. incl. illus. tables, 28 refs.
(Contract AF 33(616)8363, Proj. 6114)
(MRL TDR 62-39) Unclassified report

DESCRIPTORS: *Digital computers, *Flight simulators, Programming, Design.

To determine the ability of a moderate-sized digital computer, such as the M. I. T. TX-0, to solve a complex real-time flight simulation problem, the complete equations for the unrestricted simulation of the F-100A aircraft have been programmed using the TX-0 order code. From an analysis of this program, specific recommendations are made for logical modifications of the TX-0 to facilitate real-time simulation. With nine additional orders, including a 25-microsecond addressable multiply, a 40-microsecond divide, and a special level-sense order to facilitate nonlinear function generation, the TX-0 would solve the full F-100A equations at 23 solutions per second. The areas of function generation, order code specification, usage of subroutines, integration, word length requirement, input and output procedures, decision-making, and high-speed multiplication are investigated in detail with quantitative comparisons between different methods wherever possible. (Author)

AD-283 113 Div. 30, 2
(TISTP/GRW) OTS price $9.60

North American Aviation, Inc., Columbus, Ohio.
ADVANCED ANALYTICAL TRIANGULATION TECHNIQUES,
by J. M. Dowdy and K. W. McClure. 20 July 62, 114p. incl. illus. tables, 7 refs. (Rept. no. NA62H-193)
(Contract AF 30(602)2374, Proj. 5569)
(RADC TDR 62-253) Unclassified report

DESCRIPTORS: *Mapping, *Aerial photography, *Programming, Digital computers, Mathematical computer data, Least squares method.

A method of analytical triangulation was evaluated and programmed for the IBM 709. This program with real photographic data as input, and weighting of input data, was used to perform an empirical test of the method. The test resulted in unrealistically small ground coordinate corrections. This is attributed to the assigned weights which overly constrained the solution. Further investigation as to the effect of parameter weighting on the adjustment and methods for inversion of large matrices are recommended. (Author)

AD-283 114 Div. 30, 18
(TISTA/VGW) OTS price $2.60

Office of Aerospace Research, Washington, D. C.
OFFICE OF AEROSPACE RESEARCH CHRONOLOGY.
1962, 32p. (Rept. no. OAR-8)
Unclassified report

DESCRIPTORS: *Air force research, Research program administration, History.

The chronological listing of events briefly outlines the history of the Office of Aerospace Research (OAR) and its various component elements. The chronology is reasonably complete. (Author)

## 31. SHIPS AND MARINE EQUIPMENT

AD-281 754 Div. 31
(TISTE/CDM) OTS price $5.60

Massachusetts Inst. of Tech., Cambridge.
AN ANALYSIS OF BOW VIBRATION INDUCED BY ANTI-PITCHING FINS,
by Michael D. Pearlman, Young K. Lou, and Shen Wang. May 62, 35p. illus. 10 refs.
(Contract Nonr-184168)
Unclassified report

DESCRIPTORS: *Fins, *Ship hulls, *Hydrodynamics, Pitch, Cavitation, Ship models, Model tests, Tests, Vibration, Ships, Control surfaces.

A study was made of the exciting force, the pick-up mechanism, and the elimination of resultant system vibrations associated with the operation of anti-pitching fins on ships. The anti-pitching fin, when moving down during a pitching cycle, causes a ventilated bubble to be formed on its upper surface. It is the subsequent collapse of this bubble which gives rise to a sudden pressure impulse and is the exciting force. The pickup mechanism is the model's hull alongside of this bubble. The results indicate that either having a hole through the bow of the model in way of the bubble above the fin, or by mounting the fin forward of the model that it is possible to eliminate the impulse type vibration. It was found practical to fit a ship with an antipitching fin such that a great reduction in pitching motion is practical. The impulse vibration due to this fin system can be eliminated by proper hull design in the vicinity of the fin and the hydroelastic type vibration can be eliminated entirely by constructing a sufficiently stiff fin support. (Author)

AD-281 835 Div. 31, 14
(TISTM/GEC) OTS price $2.60

Rubber Lab., Mare Island Naval Shipyard, Vallejo, Calif.
DEVELOPMENT OF DAMPING TREATMENTS FOR NEW CONSTRUCTION SUBMARINES.
Progress rept. no. 12,
by J. Oser. 1 Aug 62. 22p. incl. illus. tables, 3 refs. (Rept. no. 94-39)
(Proj. S-F013-13-01)
Unclassified report

DESCRIPTORS: *Submarine hulls, *Metal plates, *Vibration, *Acoustic insulation, Design, Nitrile rubber, Temperature, Effectiveness, Audiofrequency, Test methods, Tests, Elastomers, Damping.

The development of elastomeric materials to replace chromated felt in constrained-layer treatments for damping heavy plating in new construction submarines was undertaken. A treatment having a weight ratio to the treated plate of 1 to 4 and utilizing a perforated nitrile rubber damping layer was found to be almost as effective as Treatment 198, a similar treatment developed by the Rubber Laboratory which utilized chromated felt. The new treatment, designated Treatment 227, consisted of an Al constraining layer 1-1/4 in. thick and a perforated nitrile rubber damping layer 1/16 in. thick. It was fastened by means of 1/2 in. studs on 12 in. centers to 1-3/4 in. thick steel plate. The average damping at 75 F for Treatment 227 over the frequency range of 50 to 2000 cps was 6.2% of critical as compared to 6.5% of critical for Treatment 198. It was found that the damping behavior of the nitrile rubber layer was affected similarly to the chromated felt by temperature change. Maximum damping occurred at 65 F. Substantially lower damping were obtained at 35 and 120 F. Work was continued on the development of damping treatments which will be efficient over the temperature range of 35 to 120 F. (Author)

AD-282 162 Div. 31
(TISTE/CAM) OTS price $3.60

Pneumodynamics Corp., Bethesda, Md.
INVESTIGATION OF A TRACTOR-TYPE WINCHING MACHINE FOR HANDLING FAIRED CABLES AND IN-LINE INSTRUMENT MODULES,
by L. W. Bonde. July 62, 28p. incl. illus, tables, 5 refs. (Rept. no. TN-SEDU-6634-3)
(Contract Nonr-320100)
Unclassified report

DESCRIPTORS: *Hoists, *Wire winding machines, *Tractors, *Towing cables, *Cable fairings, Shipborne, Cordage, Wire, Instrumentation, Pressure gages, Test equipment, Test methods, Design.

Preliminary investigation was conducted to determine the suitability of tractor-type winching machines for handling faired towlines connecting bulges several times the diameter of the basic cable. As part of this investigation, a commercially available tractor-type winch was utilized to determine the reduction in line pull attending the use of trailing-type rubber cable fairings with fairing-thickness-to-cable-diameter ratios of 0.8 to 1.0. The ability of this particular device to 'pass,' i.e., to inhaul and payout, cylindrical bulges in the towline was investigated. Tests were run with dry, wet, and greased lines. (Author)

AD-282 181 Div. 31, 9
(TISTP/JW) OTS price $2.60

David Taylor Model Basin, Washington, D. C.
WINDMILLING AND LOCKED SHAFT PERFORMANCE OF SUPERCAVITATING PROPELLERS,
by Richard Hecker. July 62, 26p. incl. illus. table, 11 refs. (Rept. no. 1625)
Unclassified report

DESCRIPTORS: *Cavitation, *Propeller blades, *Marine propellers, Torque Thrust, Rotation, Airfoils, Water, Shafts.

Open-water tests of several supercavitating propellers windmilling and nonrotating are presented. The tests are all at high cavitation indices. The windmilling operation is shown to be an extension of the powered performance at high speed coefficients. Both the thrust and torque are negative in this area of operation. Locked shaft (nonrotating) data are presented and the thrust and torque are shown to be dependent upon the size of the propeller and its projected area, but more or less independent of section shape. Judicious use of airfoil data confirms these results. (Author)

AD-282 464 Div. 31
(TISTA/GEC) OTS price $3.60

North American Aviation, Inc., Downey, Calif.
BIBLIOGRAPHY AND LITERATURE SEARCH ON HYDROFOIL SURFACE CRAFT.
1 Sep 61, 33p. (Rept. no. SID 61-157)
Unclassified report

DESCRIPTORS: *Hydrofoil boats, *Bibliography, *Hydrofoils, Design, Theory.

A survey is given of the recent open literature on hydrofoil surface craft. Both theoretical design studies and descriptions of existing hydrofoils were included. (Author)

AD-282 522 Div. 31, 8, 25
(TISTP/JW) OTS price $4.60

David Taylor Model Basin, Washington, D. C.
A PROCEDURE FOR COMPUTING THE HYDROELASTIC PARAMETERS FOR A RUDDER IN A FREE STREAM,
by Ralph C. Leibowitz and Donald J. Belz.
Apr 62, 43p. incl. illus. tables, 9 refs. (Rept. no. 1508)
Unclassified report

DESCRIPTORS: *Hydraulic systems, *Marine rudders, Computers, Ship hulls, Flutter, Vibration, Mathematical analysis, Fluid flow, Elasticity.

Methods for evaluating the hydroelastic parameters for a rudder moving in a free stream are

described As an example, the hydroelastic parameters for the rudder of USS ALBACORE are evaluated. By means of a theory referenced in this report, computations of rudder-hull vibrations (including flutter) can then be made on a digital and/or analog computer using these rudder hydroelastic parameters and hull parameters evaluated by previously established methods. (Author)

AD-282 608 Div. 31, 25
(TISTE/CAM) OTS price $3.60

Rubber Lab., Mare Island Naval Shipyard, Vallejo, Calif.
UNDERWATER ACOUSTICAL DECOUPLING EFFICIENCY OF SOUNDAMP TYPE RAL.
Technical rept.,
by B. Jan, J. W. Hollister, and R. E. Morris.
17 Aug 62, 14p. illus. 13 refs. (Rept. no. 165-24)
(Proj. S-F013-13-01)
Unclassified report

DESCRIPTORS: *Ship noise, *Underwater sound, *Acoustic insulation, Insulating materials, Shielding, Design, Ship plates, Submarine hulls, Underwater sound transmission, Vibration, Test equipment, Test methods, Acoustic impedance, Hydrophones, Pressure, Sound generators, Pipes, Pistons, Reduction, Damping, Rubber.

A test was developed for measuring the underwater acoustical decoupling efficiency of Soundamp type RAL (rubber-air-lead), developed by the U. S. Navy Underwater Sound Laboratory for reducing the radiation of ship's noise into water. The test consists of vibrating an aluminum piston at one end of a 5.5-inch I.D. water-filled plastic pipe and measuring the generated sound pressure by means of a hydrophone in front of the piston. A specimen of the material is bonded to the face of the piston, which is then driven to the same amplitude of vibration as that used to drive the bare piston. The difference in sound pressures generated by the bare and covered piston is used to calculate the efficiency of the material. This material was tested at 74 F at frequencies from 1520 to 8630 c and at hydraulic pressures from 0 to 300 psig. Peak efficiency of the material occurred near 6800 c. At 0 psig the radiation reduction was at least 7.5 db over the entire frequency range and was over 20 db between 4700 and 8630 c. The material was less effective as the hydraulic pressure was increased. At 300 psi the radiation reduction was less than 2 db at frequencies below 4000 c and less than 5 db between 4000 and 8630 c. (Author)

AD-283 007 Div. 31
(TISTE/CRJ) OTS price $2.60

David Taylor Model Basin, Washington, D. C.
VIBRATION TESTS ON LCU 1621 EQUIPPED WITH A SPECIAL RIGHT-ANGLE DRIVE PROPULSION SYSTEM,
by N. Mawby. Aug 62, 21p. incl. illus. tables, 4 refs. (Rept. no. 1634)
Unclassified report

DESCRIPTORS: *Landing craft, Drive shafts, Propulsion, Vibration, Measurement, Mathematical analysis, Tests.

The results are presented of torsional and linear vibration tests performed on LCU 1621 which is propelled by two special right-angle drives with a propeller nozzle combination. Since one of the drives suffered bearing damage the first time it was operated in the water, trials were initiated by the Bureau of Ships to determine whether torsional criticals or other vibratory characteristics could have contributed to this damage. The results of tests are presented in the form of graphs. They show that some high linear amplitudes were present but none that could be harmful by themselves. Comparison of test results with calculated frequencies indicates that torsional criticals may exist at high and low speeds. The vibratory characteristics of the system are considered satisfactory. (Author)

AD-283 029 Div. 31, 9
(TISTE/CRJ) OTS price $19.75

Office of Naval Research, Washington, D. C.
FOURTH SYMPOSIUM ON NAVAL HYDRODYNAMICS SHIP PROPULSION AND HYDROELASTICITY, WASHINGTON, D. C., AUGUST 27-31, 1962. VOLUME I.
1962, 324p. incl. illus. tables, refs. (Rept. no. ACR-73, vol. 1)
Unclassified report

DESCRIPTORS: *Symposia, *Hydrodynamics, *Marine propellers, *Ships, Adjustable pitch propellers, Shrouded propellers, Airfoils, Theory, Mathematical analysis, Elasticity, Propulsion.

Contents:
On the theory of screw propellers - R. Yamazaki
Comparison of propeller design techniques - C. -A. Johnsson
Numerical results of Sparenberg's lifting surface theory for ship screws - J. D. van Manen and A. R. Bakker
Hydrodynamics of an oscillating screw propeller - T. Hanaoka
Design diagrams of modern four-, five-, six-, and seven-bladed propellers developed in Japan - Atsuo Yazaki
Theory of the annular airfoil and ducted propeller - W. B. Morgan
Design diagrams of three-bladed controllable pitch propellers - Kiyoshi Tsuchida
Tunnel tests on supercavitating propellers - C. B. van de Voorde and J. Esveldt
Ventilated propellers - J. W. Hoyt
Shrouded supercavitating propellers - C. F. Chen

AD-283 030 Div. 31, 9
(TISTE/CRJ) OTS price $19.75

Office of Naval Research, Washington, D. C.
FOURTH SYMPOSIUM ON NAVAL HYDRODYNAMICS SHIP PROPULSION AND HYDROELASTICITY, WASHINGTON, D. C. AUGUST 27-31, 1962. VOLUME II.
1962, 1v. incl. illus. tables (Rept. no. ACR-73, vol. 2)
Unclassified report

DESCRIPTORS: *Symposia, *Hydrodynamics, *Ships, Marine propellers, Merchant vessels, Cavitation, Hydrofoils, Pitch, Vibration, Theory, Elasticity, Moments, Mathematical analysis, Thrust, Measurement, Oscillation, Propulsion.

Contents:
On the growth of nuclei and the related scaling factors in cavitation inception - F. van der Walle
Experimental and analytical results of thrust measurements on actual merchant ships - M. Kinoshita, S. Okada, S. Sudo
Sea trial analysis of the vertical-axis propellers - K. Taniguchi
Accelerated swimming of a waving plate - T. Yao-tsu Wu
Forces and moments on an oscillating hydrofoil - P. Crimi and I. C. Statler
Unsteady characteristics of the submerged hydrofoil performing heave or pitch at constant forward speed under sinusoidal waves - T. Nishiyama

Some free surface effects on unsteady hydrodynamic loads and hydroelasticity - M. T. Landahl, H. Ashley, S. M. Widnall
Review and extension of theory for near-field propeller-induced vibratory effects - J. P. Breslin
Interaction forces between an appendage and a propeller - O. Pinkus, J. R. Lurye, S. Karp
Numerical and experimental investigations of the dependence of transverse force and bending moment fluctuations on the blade area ratio of five-bladed ship propellers - J. K. Krohn

AD-283 031 Div. 31, 9
(TISTE/CRJ) OTS price $19.75

Office of Naval Research, Washington, D. C.
FOURTH SYMPOSIUM ON NAVAL HYDRODYNAMICS SHIP PROPULSION AND HYDROELASTICITY, WASHINGTON, D. C., AUGUST 27-31, 1962, VOLUME III.
1962, 1v. incl. illus. tables, refs. (Rept. no. ACR-73, vol. 3)
Unclassified report

DESCRIPTORS: *Symposia, *Hydrodynamics, *Ships, Hydrofoils, Flutter, Theory, Elasticity, Control surfaces, Vibration, Underwater explosions, Blast, Ship hulls, Motion, Pressure, Cavitation, Propulsion.

Contents:
Design problems in hydroelasticity-A. J. Giddings
The flutter characteristics of a hydrofoil strut-C. E. Squires, Jr., E. Baird
Comparison of hydrofoil flutter phenomenon and airfoil flutter theory-C. J. Henry
Comparison of theory and experiment for marine control-surface flutter-R. C. Leibowitz, D. J. Belz
Effects of underwater explosions on elastic structures-G. Chertock
Hydrodynamic impact with application to ship slamming-K. M. Ochi, M. D. Bledsoe
Pulsation of two-dimensional cavities-C. S. Song
Flow-induced cavity resonance in viscous compressible and incompressible fluids-W. H. Dunham

## 32. MISCELLANEOUS ARTS AND SCIENCES

AD-281 850 Div. 32
(TISTB/AW) OTS price $4.60

RAND Corp., Santa Monica, Calif.
STUDIES IN RUSSIAN MORPHOLOGY. I. THE SUFFIX-AGA,
by Dean S. Worth. Aug 62, 38p. incl. tables. (Research memo. no. RM-3235-PR)
(Contract AF 49(638)700)
Unclassified report

DESCRIPTORS: *Philology, *Language, USSR, Distribution, Analysis, Vocabulary, Machine translation, Bibliography.

The formal and semantic structure of Russian nouns derived from nouns, adjectives and verbs by means of the suffix -aga is analyzed. The formal devices of derivation include not only addition of the suffix itself, but specific procedures for selection of a derivational stem, and specific consonantal and vocalic alternations occasioned by the suffix. The semantic differential between base form and derivative in -aga is described in terms of differences of referential meaning and of evaluative and distributional markings. The parallelism of formal and nonformal procedures is pointed out, as is the interaction of derived and non-derived -aga forms.

AD-281 900 Div. 32 All ASTIA Subject Divs. enter under Div. 32 in TAB
(TISTB/CCH) OTS price $5.00

Armed Services Technical Information Agency, Arlington, Va.
BIBLIOGRAPHY OF BIBLIOGRAPHIES. AN ASTIA REPORT BIBLIOGRAPHY,
comp. by Katye M. Gibbs and Elizabethe H. Hall. Aug 62, 1v. 2001 refs. (Suppl. to AD-74 436 and AD-147 723)
Unclassified report

DESCRIPTORS: *Bibliography, *Documentation, *Library science, *Scientific research, *Military publications, *Catalogs, Abstracting, Classification, Reports.

This list of bibliographies cataloged by ASTIA from 1953 through July 1962 is prepared as an aid in determining the extent of information available on subjects of research and development interest. Citations in this bibliography include only unclassified, unlimited references; a separate volume, AD-331 100, includes classified and limited unclassified citations. This bibliography is a supplement to AD-74 436 and AD-147 723; however, this volume contains only references to reports in the AD collection at ASTIA.

AD-281 909 Div. 32, 30
(TISTP/JW) OTS price $1.10

System Development Corp., Santa Monica, Calif.
STATISTICAL SEMANTICS,
by Lauren B. Doyle. 11 July 62, 5p. (Rept. no. SP-878)
Unclassified report

To be presented at the panel of Semantics and Syntactics at the 1962 IFIP Congress in Munich, Germany.

DESCRIPTORS: *Catalogs, *Mathematical analysis, *Data processing systems, Applied mathematics, Computer logic, Library science.

Three small libraries in physics, in European current events, and in information retrieval are represented by three groups of 100 lists, each list of which simulates output of a computer program which determines the 12 most frequent content words of a document. Homographs of words which occur in any two of the three libraries are inventoried to ascertain how cleanly the homographs are separated as a consequence of separating the libraries from each other. Three kinds of homograph separation are specified--doubtful, partial, and clean-cut. The latter was found to predominate in this study, as a result of the variegation and small size of the libraries. It is hypothesized that for statistically separable libraries somewhat closer in subject matter and/or larger, lower percentages of clean-cut separations should occur, but that there are countertrends which could make these effects less important. (Author)

AD-281 940 Div. 32, 17, 14, 2
(TISTM/MS) OTS price $4.60

National Research Council, Washington, D. C.
FUTURE U. S. IMPORTS OF INDUSTRIAL RAW MATERIALS AND THEIR OCEAN TRANSPORTATION,
by Robert B. Keating. Jan 62, 38p. incl. tables, 6 refs. (Rept. no. NRC:CUW:0293)
Unclassified report

DESCRIPTORS: *Industry, *Industrial procurement, *Shipping, *Materials, Transportation, Cargo ships, Commerce, Ores, Minerals, Supplies.

A survey was made which indicates that U.S. industry is increasingly dependent upon foreign sources of raw materials. Many of the primary producing countries are located in the underdeveloped regions of the world, thousands of miles from the United States, and surface shipping affords the principal means of commerce with these areas. These raw materials and the ability to import them are important elements of our national strength. (Author)

AD-282 107 Div. 32, 15
(TISTB/MS) OTS price $3.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
RESEARCH AND DEVELOPMENT, TECHNICAL CHANGE AND THE COMPETITIVE MECHANISM,
by Mordecai Kurz. 20 July 62, 33p. incl. illus. refs. (Technical rept. no. 118)
(Contract Nonr-22550, Proj. NR 047-004)
Unclassified report

DESCRIPTORS: *Economics, *Functions, *Probability, *Industrial research, Industrial production, Mathematical prediction, Theory, Calculus of variations, Applied mathematics.

AD-282 169 Div. 32, 15
(TISTB/AW) OTS price $14.00

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ADAPTIVE PROCESSES IN ECONOMIC SYSTEMS,
by Roy E. Murphy, Jr. 30 July 62, 202p. refs. (Technical rept. no. 119)
(Contract Nonr-22550, Proj. NR 047-004)
Unclassified report

DESCRIPTORS: *Economics, *Probability, *Decision making, *Social sciences, Communications theory, Statistical analysis, Statistical processes, Money, Information theory, Selection, Games theory, Cybernetics, Binomials, Theory, Economics.

Contents:
Introduction
The adaptive process in social systems
Adaptive processes in biological systems
Adaptive processes in cybernetics
The fundamental properties of adaptive processes
The adaptive principle of optimality
The general adaptive process
The stochastic growth process
The binomial investment process
Some investment processes other than the binomial process
The most likely probability distribution function for the underlying stochastic process
Entry of the new investor into the market
Statistical equilibrium in the investment market

AD-282 244 Div. 32
(TISTB/MS) OTS price $9.60

Little, Arthur D., Inc., Cambridge, Mass.
STUDIES FOR THE DESIGN OF AN ENGLISH COMMAND AND CONTROL LANGUAGE SYSTEM.
June 62, 118p. incl. illus. tables, refs. (Rept. no. CACL-1)
(Contract AF 19(628)256)
(ESD TR 62-45) Unclassified report

DESCRIPTORS: *Information retrieval, Language, Computers, Documentation, Data processing systems, Dictionaries, Vocabulary, Automatic.

The report concerns research toward the design of natural language automatic fact retrieval systems for command and control applications. The difficulties of the problem are discussed and a research strategy formulated. A discussion is then given of the possible roles of syntactic information in sentence processing, and the Harvard computer program for syntatic analysis is described. Mathematical network models are developed for sentence retrieval using word associations. Finally, a procedure for testing the utility of syntactic information in retrieval applications is presented. (Author)

AD-282 475 Div. 32, 5
(TISTB/CCH) OTS price $3.60

North American Aviation, Inc., Downey, Calif.
PREDETECTION RECORDING. A LITERATURE SURVEY.
10 July 62, 28p. (Rept. no. SID 62-828)
Unclassified report

DESCRIPTORS: *Magnetic recording systems, *Literature, *Magnetic detectors, *Telemetering data, High frequency, Broadband, Antennas, Bibliography.

A survey of the literature since 1957 on high frequency, wideband magnetic tape recording of telemetered data is given. Much of the material included is on a technique called predetection, which consists of data recording at immediate frequencies (up to 5 megacycles/sec and on a 4 - 5 megacycle/sec bandwidth); this technique provides for high volume, large parameter reception and storage of data for study at a later time. (Author)

AD-282 517 Div. 32
(TISTB/AW) OTS price $5.60

RAND Corp., Santa Monica, Calif.
THE KHRUSHCHEV SUCCESSION PROBLEM,
by M. Rush. 25 Apr 61, 51p. 25 refs. (Rept. no. P-2283)
Unclassified report

DESCRIPTORS: *Political science, *Communism, USSR, Presidents, Theory.

Consideration is given to the economic and social progress in the Soviet society as a serious problem for the regime that is certain to have important political consequences. Progress cannot in the next decade change the regime's totalitarian character unless it is seriously weakened by a succession crisis. In addition, a third condition is necessary. Unless the West succeeds in checking Soviet expansion, the regime may be able to preserve itself unchanged by capitalizing on its achievements on the world scene. The Khrushchev succession crisis will not save the West; it can only help the West to save itself. A general theory about the succession problem in the Soviet system is presented. It is illustrated and elaborated by a short analytical account of the crisis brought on by Stalin's death. The theory is then applied to the forthcoming Khrushchev succession crisis. (Author)

AD-282 602 Div. 32, 30
(TISTP/TL) OTS price $2.60

RAND Corp., Santa Monica, Calif.
DETAB-X: AN IMPROVED BUSINESS-ORIENTED COMPUTER LANGUAGE,
by Solomon L. Pollack. Aug 62, 18p. incl. illus. tables, 6 refs. (Memo. RM-3273-PR)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: *Language, *Computers, *Mathematical prediction, *Tables, *Experimental data, Data processing systems, Programming, Personnel, Cost, Management engineering.

An analysis which describes one of the latest developments in computer languages, DETAB-X (Decision-Tables, Experimental) is described. In an effort to illustrate some of the features of DETAB-X, it is compared with COBOL-61 (Common Business-Oriented Language), using examples of data and procedures written in both languages. (Author)

AD-282 697 Div. 32
(TISTB/AW) OTS price $3.60

Massachusetts Inst. of Tech., Cambridge.
ANALYSIS OF BIBLIOGRAPHIC SOURCES IN THE PHYSICAL REVIEW (VOL. 77, 1950 TO VOL. 112, 1958),
by M. M. Kessler and F. E. Heart. 13 July 62, 35p. incl. tables, refs. (Rept. no. R-3)
(In cooperation with Lincoln Labs., Mass. Inst. of Tech.)
Unclassified report

DESCRIPTORS: *Periodicals, *Physics, *Information retrieval, Scientific reports, Statistical analysis, Bibliography, Indexes.

A total of 8521 articles in 36 volumes of the Physical Review yielded 137,108 references to 805 sources. Some statistical properties of the list are discussed. Three classes of periodic literature in science are defined from the statistics: (a) the definitive journal; (b) a closed list of widely used journals; (c) an open list of rarely used journals. The hypothesis is advanced that the difference in the statistics of the three classes of literature reflects a difference in function that will have to be considered in the design of a realistic science communication system. (Author)

AD-282 765 Div. 32, 5
(TISTB/AW) OTS price $14.50

Michigan U., Ann Arbor.
ACOUSTICAL CHARACTERISTICS OF SELECTED ENGLISH CONSONANTS,
by Ilse Lehiste. July 62, 220p. incl. illus. tables (Rept. no. 9)
(Contract AF 49(638)492)
(AFOSR-2093) Unclassified report

DESCRIPTORS: *Language, *Speech, Acoustics, Analysis, Spectrographic analysis.

Contents:
Some allophones of /l/ in American English
Some allophones of /r/ in American English
A study of /w/ and /y/ in American English
A study of /h/ and whispered speech

AD-283 012 Div. 32
(TISTP/FR) OTS price $3.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
MECHANIZED INFORMATION RETRIEVAL SYSTEM.
Status rept.,
by G. W. Koriagin and L. R. Bunnow. Jan 62, 29p. incl. illus. 4 refs. (Rept. no. SM-39167)
Unclassified report

DESCRIPTORS: *Information retrieval, Libraries, Reports, Data processing systems, Digital computers, Printing, Catalogs.

The current status of the mechanized information retrieval system for the Douglas Aircraft Co. is discussed. The bibliographic data sub-system, dictionary sub-system, and the automatic selective dissemination of information and literature searching sub-systems are discussed. Cost data and future applications of the system are included, and a comparison is made between the originally proposed system and the existing system. (Author)

AD-283 023 Div. 32
(TISTB/CCH) OTS price $8.60

European Office of Aerospace Research, Brussels (Belgium).
BIBLIOGRAPHY OF TECHNICAL NOTES AND TECHNICAL REPORTS. SUPPLEMENT.
1 July 62, 94p.
Unclassified report

DESCRIPTORS: *Bibliography, *Scientific reports, Biology, Chemistry, Electronics, Geophysics, Materials, Mathematics, Mechanics, Metallurgy, Physics, Propulsion, Solid state physics, Europe.

AD-283 047 Div. 32
(TISTP/FR) OTS price $3.60

Bureau of Reclamation, Denver, Colo.
CALCULATION OF FIRM POWER RATE FOR POWER SYSTEM PAYOUT.
Report on Electronic Computer Program Description no. E-106.
July 62, 33p. incl. illus.
Unclassified report

DESCRIPTORS: *Economics, *Electric power production, Power plants, Mathematical analysis, Digital computers, Programming.

A program is given which will calculate the number of years necessary for a power project to pay out with an approximate firm power rate and the known and estimated available power, deductions, etc.; and then compare this number of years with the desired number of years and compute a new firm rate. With a new firm rate the program repeats the above cycle until the necessary rate is determined for the project to pay out in the specified number of years. Approximately 1 minute is required to compute the necessary rate for a 50-year study (7 to 9 cycles). For each cycle, the computer determines the firm rate; the allowance and discount rate; the balance to be repaid; the net revenue; the net interest; the net principal; the 'in service at end of year' for the actual payout period for power and for irrigation and the desired payout period for power if it occurs before the actual payout period. By adding a single instruction card, the program will also punch out the above results for each year. (Author)

## 33. TRANSPORTATION

AD-282 117 Div. 33
(TISTB/MS) OTS price $9.10

Northwestern U., Evanston, Ill.
THE STRUCTURE OF TRANSPORTATION NETWORKS,
by W. L. Garrison and D. F. Marble. May 62, 100p. incl. illus. tables, 30 refs.
(Contract DA 44-177-tc-685)
(TCREC TR 62-11) Unclassified report

DESCRIPTORS: *Air transportation, *Transportation, Trafficability, Roads.

This monograph concerns the structure, geometry,

mesh, pattern, or layout of transportation networks. These words convey notions of the arrangements of routes, intersections, and terminals on the earth's surface, and these notions provide an adequate general identification of the concern of this research. Operational definitions are used when particular subjects are treated. For instance, a later section treats changes in the structures of networks when transportation systems are expanded and operational definitions are given at that time consistent with the needs of the subject. Suitable operational definitions are given for the comparison of transportation networks with each other. (Author)

# NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

*Descriptors marked with an asterisk are included in the subject index.

## BIBLIOGRAPHY

NASA N62-10356 $19.75

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PUBLICATIONS OF THE JET PROPULSION LABORATORY, JANUARY 1938 THROUGH JUNE 1960, by D. K. Walsh and R. J. Sippel. Rept. on Contract NASw-6. Dec 61, 336p. 2709 refs. Bibliography no. 39-1.

NASA N62-10433 $4.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THERMIONIC AND THERMOELECTRIC CONVERSION SYSTEMS, comp. by Edda Barber. Rept. on Contract NAS7-100. Mar 62, 48p. 292 refs. Astronautics Information Literature Search no. 392; AD-273 506.

## ASTRONOMY

### Astrophysics

NASA N62-15035 $4.60

Armour Research Foundation, Chicago, Ill.
RADIATIVE ENERGY TRANSFER ON ENTRY INTO MARS AND VENUS, by William O. Davies. Quarterly rept. no. 1 on Contract NASr-65(01). 1 Mar 62, 46p. 17 refs. ARF-1200-1.

NASA N62-15036 $8.10

Armour Research Foundation, Chicago, Ill.
RADIATIVE ENERGY TRANSFER ON ENTRY INTO MARS AND VENUS, by William O. Davies. Quarterly rept. no. 2 on Contract NASr-65(01). June 62, 82p. 23 refs. ARF-1200-2.

NASA N62-10120 $6.60

California Inst. of Tech., Pasadena.
ANNUAL REPORT, PART II. SUMMARY OF RESEARCH, by Harrison Brown and Bruce C. Murray. Rept. for 1 Dec 60-30 Nov 61 on Grant NsG-56-60. 31 Jan 62, 62p. 107 refs.

NYO-8922 $8.10

Carnegie Inst. of Tech., Pittsburgh, Pa.
COSMOGENIC CARBON-14 AND CHLORINE-36 IN METEORITES, by Parmatma S. Goel. Doctoral thesis Rept. on Contract AT(30-1)-844. 4 June 62, 182p. 190 refs.

NASA N62-15239 $3.60

Committee on Space Research (COSPAR), The Hague (Netherlands).
ASTEROID-IMPACT HYPOTHESIS OF TEKTITE ORIGIN. III. THE SOUTHEAST ASIAN STREWN FIELDS, by Alvin J. Cohen Rept. on Grant NsG-57-60. [1962] 31p.

Presented at Third International Space Science Symposium and Fifth COSPAR Plenary Meeting, Washington, 30 Apr-9 May 62.

NASA N62-15226 $3.60

Committee on Space Research (COSPAR), The Hague (Netherlands).
EVIDENCE FROM THE MOON'S SURFACE FEATURES FOR THE PRODUCTION OF LUNAR GRANITES, by John A. O'Keefe and Winifred Sawtell Cameron. [1962] 33p. 38 refs. X-640-62-36.

Presented at Third International Space Science Symposium and Fifth COSPAR Plenary Meetings, Washington, 30 Apr-9 May 62.

NASA N62-15186 $1.60

Committee on Space Research (COSPAR), The Hague (Netherlands).
THE ORBITING SOLAR OBSERVATORY SPACECRAFT, by F. P. Dolder, O. E. Bartoe and others. [1962] 19p.

Presented at third International Space Science Symposium and Fifth COSPAR Plenary Meeting, Washington, 30 Apr-9 May 62.

NASA N62-15234 $1.60

Committee on Space Research (COSPAR), The Hague (Netherlands).
PRELIMINARY SOLAR FLARE OBSERVATIONS WITH A SOFT X-RAY SPECTROMETER ON THE ORBITING SOLAR OBSERVATORY, by W. E. Behring, W. M. Neupert, and J. C. Lindsay. [1962] 15p. 3 refs. X-614-62-29.

Presented at Third International Space Science Symposium and Fifth COSPAR Plenary Meeting, Washington, 30 Apr-9 May 62.

NASA N62-15225 $4.60

Committee on Space Research (COSPAR), The Hague (Netherlands).
REVIEW OF DIRECT MEASUREMENTS OF INTERPLANETARY DUST FROM SATELLITES AND PROBES, by W. M. Alexander, C. W. McCracken and others. [1962] 43p. 50 refs. X-613-62-25.

Presented at Third International Space Science Symposium and Fifth COSPAR Plenary Meeting, Washington, 30 Apr-9 May 62.

NASA N62-15243 $2.60

Committee on Space Research (COSPAR), The Hague (Netherlands).
SIMULTANEOUS BALLOON OBSERVATIONS AT FT. CHURCHILL AND MINNEAPOLIS DURING THE SOLAR COSMIC RAY EVENTS OF JULY 1962, by D. J. Hofmann and J. R. Winckler. [1962] 24p. 7 refs.

NASA N62-15098 $2.60

Enrico Fermi Inst. for Nuclear Studies, U of Chicago, Ill.
ON THE OBSERVED FILAMENTARY STRUCTURE OF THE SOLAR WIND, by E. N. Parker. Rept. on Grant NsG-96-60. Dec 61, 29p. 21 refs. EFINS-61-71.

NASA N62-14784 $0.50

Goddard Inst. for Space Studies, National Aeronautics and Space Administration, New York.
THE EARLY CHRONOLOGY OF THE SOLAR SYSTEM, by A. G. W. Cameron. Aug 62, 14p. 6 refs. NASA TN-D-1465.

NASA N62-10052 $9.10

Grumman Aircraft Engineering Corp., Bethpage, N. Y.
IMPROVED PARTICLE-CHARGING TECHNIQUE, by A. J. Favale, F. R. Swanson and others. Rept. on Contract NASw-149. Feb 62, 94p. 21 refs. RE-152.

NASA N62-15603 $5.60

Institute for Advanced Study, Princeton, N. J.
NEUTRINO EMISSION PROCESSES, STELLAR EVOLUTION AND SUPERNOVA. PART II, by H. Y. Chiu. [1961] 54p. 18 refs.

NASA N62-15715 $6.60

Iowa State U., Iowa City.
A NEW METHOD OF COMPUTING COSMIC RAY CUT-OFF RIGIDITY FOR SEVERAL GEOMAGNETIC FIELD MODELS, by Herbert H. Sauer. Doctoral thesis. Rept. on Grant NsG-233-62 and Contract N9onr-93803. Aug 62, 63p. 12 refs. SUI-62-17.

NASA N62-10199 $5.60

Maryland U., College Park.
THE LUNAR ATMOSPHERE, by Ernst J. Opik. Rept. on Grant NsG-58-60. [1962] 59p. 31 refs. Dept. of Physics Technical rept. 240.

NASA N62-14641 $3.60

Stanford Research Inst., Menlo Park, Calif.
EVALUATION OF INFRARED SPECTROPHOTOMETRY FOR COMPOSITIONAL ANALYSIS OF LUNAR AND PLANETARY SOILS, by R. J. P. Lyon. Interim rept. no. 1, 1 Jan-15 May 62, on Contract NASr-49(04). 25 May 62, 31p. SRI Proj. PSU-3943.

## BEHAVIORAL SCIENCES

### Human Engineering

PB 162 095 $3.60

Air Crew Equipment Lab., Naval Air Material Center, Philadelphia, Pa.
ENVIRONMENTAL REQUIREMENTS OF SEALED CABINS FOR SPACE AND ORBITAL FLIGHTS. A SECOND STUDY. PART 1: RATIONALE AND HABITABILITY ASPECTS OF CONFINEMENT STUDY, by Neal Burns. 8 Dec 59, 36p. 24 refs. Rept. no. NAMC-ACEL-413: TED NAM AE-1403; AD-229 908.

DESCRIPTORS: Space flight, *Space medicine, *Spaceship cabins, Physiology; Psychology; Tests, *Closed cycle ecological systems, *Respiration, Oxygen, Production.

An introduction is given to a six-part report on a confinement experiment in which six men were isolated for a period of eight days in a chamber of limited space and facilities equipped with a new type of rebreathing system. A description of the test chamber and of the performance measures that were used is given. (Author)

PB 159 855 $10.10

Courtney and Co., Philadelphia, Pa.
ACTIVITY ANALYSIS OF POSITIONS IN A HIGH ACTIVITY ARTC CENTER, by C. Glenn Davis, Wallace H. Wallace and others. Rept. on Contract FAA/BRD-40. 30 June 60, 122p. Rept. no. 37.

DESCRIPTORS: *Air control centers, Human engineering, *Air traffic controllers, *Personnel, Test methods, Statistical analysis, *Communication theory.

This report describes an activity analysis of controllers in the New York Air Route Traffic Control Center, which has high density traffic. The activity analysis data were collected primarily by means of time sampling, in which a controller's activity was recorded at 10-second intervals. Over 1,000 observations were made on each position. A unique char-

acteristic of the data collection was the use of functional categories which were in terms of the meaning of the controller's activity for the Air Traffic Control System. The activity analysis data indicated the percentage of time controllers spent in each type of activity. Process charts are presented describing each activity required in dealing with a typical aircraft's flight. A link analysis describes the communication activities and the use of different channels. The report concludes with a discussion of some of the human factor problems encountered in the center.

## Psychology

PB 162 159 $1.60

Kresge Eye Inst., Detroit, Mich.
DYNAMIC VISUAL ACUITY WHEN THE REQUIRED PURSUIT MOVEMENT OF THE EYE IS IN A VERTICAL PLANE, by James W. Miller and Elek Ludvigh. Rept. no. 2 on Contract Nonr-58600. 11 May 53, 13p. Joint Proj. no. NM 001 075.01.02; AD-17 022.

DESCRIPTORS: *Visual acuity, Visual preception, Eye, Test methods.

The visual acuity of 9 subjects deteriorated as the angular velocity of a test object moving in a horizontal plane was increased from 20°/sec to 140°/sec. Visual acuity was evaluated in terms of static and dynamic acuity. Neither static nor dynamic acuity was significantly dependent on the plane in which the test object moved. Subjects who were velocity-resistant to horizontal movement were affected similarly by the vertical movement of the test object, suggesting the dependence of dynamic visual acuity upon the efficiency of the entire oculomotor pursuit mechanism rather than upon the strength of normal individual muscles. (See also PB 160 746)

PB 160 067 $4.60

Naval Medical Research Inst., Bethesda, Md.
THE RELATIONSHIP BETWEEN PSYCHOGALVANIC ACTIVITY AND PILOT PERFORMANCE UNDER SIMULATED INSTRUMENT FLYING CONDITIONS, by Thomas A. Hussman, Jr. and Ray C. Hackman. Vol. 13, p. 581-620. 26 Sep 55, 41p. Research rept. on Project NM 001 056.08.02.

DESCRIPTORS: *Galvanic skin response, *Pilots, Reaction (Psychology), Emotions, *Flight simulators, Air speed, Instrument flight.

This report presents the results of an experimental investigation of the relationship between skilled performance and the emotional activity which precedes, accompanies, or follows it as measured by the galvanic skin response (GSR). The performance of twelve Navy pilots was measured as each flew eighteen 12 minute precision maneuvers under simulated instrument conditions. Alternate trials were performed without the use of the attitude instruments to test the effect of this reduction in information on performance and GSR. A time sampling system of recording the deviations of the plane's instruments from their expected readings and continuous recordings of the pilot's skin resistance yielded the basic measures of the two variables. A correlation analysis designed to relate anticipatory, concurrent, and delayed emotional responses to performance during 30-second time samples was performed both within individuals and treating the indiduals as a group.

# BIOLOGICAL SCIENCES

## Anatomy and Physiology

PB 162 148 $1.60

[6570th Aerospace Medical Research Labs., Aerospace Medical Div.] Wright-Patterson AFB, Ohio.
OSMOTIC REGULATION OF TOTAL BODY FLUIDS, by George D. Zuidema, Neville P. Clark, and Mary F. Minton. Rept. for Mar 55-July 56, on Biophysics of Acceleration. Nov 56, 14p. WADC Technical rept. no. 56-588; AD-110 569.

DESCRIPTORS: *Osmotic pressure, Control, *Body fluids, Diuretics, Physiology.

NASA N62-15637 $1.60

Bureau of Medicine and Surgery, Washington, D. C.
FUTURE OF ANIMAL CALORIMETRY, by T. H. Benzinger. Rept. on NASA Order R-38. [1962] 13p. 9 refs.

NASA N62-15219 $1.60

Committee on Space Research (COSPAR), The Hague (Netherlands).
THE SIGNIFICANCE OF THE VESTIBULAR ORGANS IN THE PROBLEMS POSED BY WIEGHTLESSNESS, by Ashton Graybiel. Rept. on NASA Grant R-47. [1962] 18p. 37 refs.

Presented at Third International Space Science Symposium and Fifth COSPAR Plenary Meeting, Washington, 30 Apr-9 May 62.

NASA N62-14822 $1.00

Manned Spacecraft Center, National Aeronautics and Space Adminstration, Houston, Tex.
PHYSIOLOGICAL SENSORS FOR USE IN PROJECT MERCURY, by Charles D. Wheelwright. Aug 62, 38p. 5 refs. NASA TN-D-1082.

PB 160 064 $1.10

Naval Medical Research Inst., Bethesda, Md.
REGULATION OF THE SECRETION OF ALDOSTERONE-LIKE MATERIAL, by George Rosenfeld, Eugenia Rosemberg (Worchester Foundation for Experimental Biology) and others. Vol. 14, p. 45-54. 18 Jan 56, 10p. 9 refs. Research rept. on Project NM 006 012.04.89.

DESCRIPTORS: *Adrenal glands, Biological assay, *Aldosterone, Secretion, ACTH, Growth substances, Potassium, Sodium, Ions.

Preliminary studies involving paper chromatography and bioassay demonstrated that isolated calf adrenals secreted a highly active aldosterone-like material when perfused at 37.5° C. with a well-oxygenated, physiologically balanced and buffered salt solution. In the present experiments the artificial perfusion medium was modified by the addition of 10-25 I.U/1/hr. of ACTH (Upjohn's Corticotrophin) or 125 mg/1. of growth hormone (Armour's Somatotrophin) in order to ascertain the influence of these factors on the production and release of Na-retaining material. The effect of lowering the Na concentration of the medium from 149 to 125 meq/1. and raising the K concentration from 3.5 to 25 meq/1. was also investigated. Four calf adrenals were employed for each experimental perfusion and the four contralateral glands for each control. The bioassay data obtained indicated that the addition of growth hormone did not exert a significant influence on the Na-retaining activity of the effluents. The stimulative effect of added ACTH was suggestive but not unequivocally demonstrated. However, the appreciable Na/K imbalance (5/1) induced a significantly augmented output of aldosterone-like material. (Author)

PB 160 065 $1.10

Naval Medical Research Inst., Bethesda, Md.
THE RELATION OF BODY WATER CONTENT TO BODY BUILD IN A GROUP OF HEALTHY MEN, by C. Wesley Dupertuis (Western Reserve U. School of Medicine), Grover C. Pitts and others. Research rept. on Project NM 004 006.03.07. 28 July 51, 10p. 25 refs.

DESCRIPTORS: *Anthropometry, *Body fluids, Water, Body weight.

A study of total body water and somatotype has been carried out on a group of 8.1 normal male subjects. It has been found that Sheldon's first component of the somatotype (endomorphy), which is a rating of the round, "soft" aspect of the physique, correlates inversely with per cent total body water as determined by antipyrine dilution ($r = -.797$). No significant correlation was found between body water and the other two components of the somatotype (mesomorphy and ectomorphy). The regression equation for calculating body water (y) from the first component rating (x) is: $y = 75.726 - 4.334x$. The standard error of estimate for this equation is 3.7 per cent. No significant relationship could be demonstrated between individual variations in per cent water in the "lean body mass" and body build in general, or the individual components of the somatotype. (Author)

PB 160 066 $1.60

Naval Medical Research Inst., Bethesda, Md.
THE RELATION OF SPECIFIC GRAVITY TO BODY BUILD IN A GROUP OF HEALTHY MEN, by C. Wesley Dupertuis, Grover C. Pitts and others. Rept. on Project NM 004 006.03.06 (formerly X-191). 19 June 50, 17p. 5 refs.

DESCRIPTORS: *Anthropometry, *Body weight, Density, Body fats.

Specific gravity determinations by underwater weighing, calculation of per cent body fat, and descriptors of physique by Sheldon's somatotyping technique were carried out on a group of 81 healthy male subjects selected to include representatives of the extremes of body build. The average age of this group was 26.6 years and the average weight, 165 pounds. The data reveal that people of different body types vary enormously in specific gravity. Soft, round, fat individuals have a low body density, whereas lean people, whether heavily muscled or delicately built, are uniformly of higher body density. (Author)

PB 160 071 $1.60

Naval Medical Research Inst., Bethesda, Md.
THE REPRODUCIBILITY AND CONSTANCY OF THE PLATELET COUNTS, by George Brecher (National Inst. for Arthritis and Metabolic Diseases), Marvin Schneiderman (National Cancer Inst.), and Eugene P. Cronkite. Vol. 10, p. 721-734. 17 Nov 52, 14p. 18 refs.
Research rept. on Project NM 006 012.05.10.

DESCRIPTORS: *Blood platelets, *Blood counts, Statistical analysis, Microscopy.

Direct platelet counts performed with the phase microscope on venous blood collected in siliconed test tubes accurately reflect the circulating platelet level. The error of the single count is 11 per cent, and can be reduced only by doing multiple counts. Platelet counts on capillary blood from a finger puncture are subject to greater errors (24%) and the counts are on the average 21/2 per cent lower. This is presumably due to a variable loss of platelets in the puncture wound and does not necessarily indicate a lower circulating capillary platelet level. The main advantage of the platelet counts with the phase microscope is the easy and certain recognition of individual platelets, and it is believed that this accounts for its satisfactory reproducibility, even by inexperienced technicians. Other methods of platelet counting are reviewed and the necessity for detailed statistical analysis of counts is illustrated. In 13 healthy males platelet levels varied greatly between individuals, but individual platelet counts showed only minor variations during a five months' period. (Author)

PB 160 072 $1.60

Naval Medical Research Inst., Bethesda, Md.
RESPIRATORY EXCRETION OF METHYL ALCOHOL BY WHITE RATS, by T. E. Shea, Jr., C. H. Hine and others. Rept. no. 4 on Project NM 007 031. 23 July 47, 11p. 6 refs.

DESCRIPTORS: Excretion, *Respiratory system, Rats, *Methanols.

The excretion of methyl alcohol from the body by the respiratory system was studied by passing expired air through an acid potassium dichromate solution at room temperature and measuring the chromate found. When 1983 mg. of methyl alcohol was given by gavage to white rats they excreted methyl alcohol at a rate of

31 per cent over a period of 96 to 138 hours. The inhalation of 8 per cent carbon dioxide in oxygen for short periods (up to 90 minutes per eight hour sampling period) had little effect on the total respiratory excretion of methyl alcohol. (Author)

NASA N62-15553 $1.60

Naval School of Aviation Medicine, Pensacola, Fla.
SURVIVAL OF ANIMALS IN MAGNETIC FIELDS OF 120,000 GAUSS, by Dietrich E. Beischer. Rept. on NASA Order R-39 and Rept. no. 6 on Proj. MR005.13-9010. 25 July 62, 14p. 9 refs.

NASA N62-15597 $1.10

Northrop Space Labs., Hawthorne, Calif.
BIOLOGICAL AND PHYSIOLOGICAL STUDIES OF PEROGNATHUS (POCKET MICE), by R. G. Lindberg and D. F. Mitchell. Quarterly status rept. no. 1, 1 Mar-31 May 62, on Contract NASr-91. [1962] 7p. 2 refs. NSL-62-125.

## Biochemistry

NASA N62-15697 $1.60

Institute for Space Biosciences, Florida State U., Tallahassee.
ABIOTIC PRODUCTION OF PRIMITIVE PROTEIN AND FORMED MICROPARTICLES, by Sidney W. Fox and Shuhei Yuyama. Rept. on NIH Grant C-3971(04) and NASA Grant NsG-173-62. [1962] 15p. 30 refs.

UCRL-10156 $2.00

Lawrence Radiation Lab., U. of California, Berkeley.
BIO-ORGANIC CHEMISTRY. Quarterly rept. Dec 61-Feb 62, on Contract W-7405-eng-48. 3 Apr 62, 91p. 119 refs.

PB 160 058 $1.60

Naval Medical Research Inst., Bethesda, Md.
RATE BEHAVIOR AND CONCENTRATION PROFILES IN GEOMETRICALLY CONSTRAINED ENZYME SYSTEMS, by Jacob J. Blum and Donald J. Jenden. Vol. 14, p. 503-520. 25 June 56, 19p. 12 refs. Research rept. on Project NM 000 018.04.15.

DESCRIPTORS: *Reaction kinetics, Morphology, *Enzymes, *Cells (Biology), *Tissues (Biology), Mathematical prediction, Diffusion, Permeability, Velocity.

The rate behavior of cells or tissues of several geometrical shapes (spheres, cylinders, sheets) has been discussed for the case when the enzyme in the cell is consuming substrate according to the Michaelis-Menten rate law. Equations are derived which permit the analysis of experimental data to obtain the maximum velocity of the enzyme, its Michaelis-Menten constant, and the permeability and internal diffusion constants of the cell. Equations are also presented which enable one to compute the concentration profile in a cell for any (maintained) external concentration. Calculations have been made for several typical cases. (Author)

NASA N62-10156 $4.60

Space Sciences Lab., U. of California, Berkeley.
BIOCHEMICAL ACTIVITIES OF TERRESTRIAL MICROORGANISMS IN SIMULATED PLANETARY ENVIRONMENTS. Rept. on Grant NsG-126-61. 1961, 44p. Series 3, issue 1.

NASA N62-10069 $8.10

Resources Research, Inc., Washington, D. C.
RADIOISOTOPIC BIOCHEMICAL PROBE AND EXTRATERRESTRIAL LIFE. Annual progress rept. on Contract NASr-10. Feb 62, 88p. 8 refs.

PB 162 109 $3.60

Uppsala U. (Sweden).
INVESTIGATION OF THE METHODS FOR SEPARATING BIOLOGICALLY AND MEDICALLY IMPORTANT SUBSTANCES OF LARGE MOLECULAR WEIGHT, by Arne Tiselius. Final technical rept. no. 1 on Contract DA 91-508-EUC-287. 28 Feb 59, 35p. AD-212 715.

DESCRIPTORS: *Proteins, Separation, *Viruses, *Electrophoresis, Chromatographic analysis, Ion exchange.

Contents:
Development of zone electrophoresis
Zone electrophoresis in packed vertical columns
Free zone electrophoresis in a revolving tube
Zone electrophoresis in agar suspensions
Particle fractionation in liquid two-phase systems
Concentration of diluted virus suspension
Isolation of ribonucleoprotein particles from rat brain
Methodological work on ion exchange chromatography

## Microbiology

NASA N62-10045 $3.60

Armour Research Foundation, Chicago, Ill.
LIFE IN EXTRATERRESTRIAL ENVIRONMENTS, by Kenneth B. Basa and Ervin J. Hawrylewicz. Phase rept. on Contract NASr-22. Feb 62, 29p. 63 refs. ARF-3194-4.

NASA N62-14638 $1.60

Armour Research Foundation, Chicago, Ill.
LIFE IN EXTRATERRESTRIAL ENVIRONMENTS, by Charles A. Hagen and Ervin J. Hawrylewicz. Quarterly status rept. 15 Feb-15 May 62, on Contract NASr-22. 1962, 20p. ARF-3194-5.

PB 160 442 $1.10

Naval Medical Research Inst., Bethesda, Md.
A STUDY OF THE O ANTIGENIC RELATIONSHIP OF 21 BACILLUS COLUMBENSIS STRAINS AND 121 KAUFFMANN GROUP O COLIFORMS, by L. A. Barnes, P. Deberry, and J. D. Gillmore. Vol. 13, p. 189-196. 9 May 55. 8p. 5 refs. Research rept. on Project NM 005 048.04.18.

DESCRIPTORS: *Escherichia, Identification, Antigens, Antibodies, Fermentation, Bacteria.

In 1951 Kauffman stated that organisms previously designated as Bacillus columbensis belong to the Escherichia group. In this study, 21 cultures, biochemically compatible with B. columbensis, were examined by serological methods in an attempt to clarify this relationship. Reciprocal O adsorption tests with the columbensis strains and 121 of Kauffmann's coliform O groups demonstrated that all the columbensis strains could be proven to be either O identical or closely related to one or more of Kauffmann's coliforms. Although certain biochemical discrepancies existed between the columbensis and coliform strains examined, the close relationship of their O antigenic groups indicates that the columbensis strains should be classified as non-lactose or late lactose fermenting Escherichia strains. (Author)

TID-16071 $7.60

Purdue U., Lafayette, Ind.
THE IDENTIFICATION OF PHOSPHATE COMPOUNDS ISOLATED FROM PENICILLIUM CHRYSOGENUM Q-176, by John Kennely McDonald. Master's thesis. Aug 56, 80p. 54p.

TID-16072 $12.00

Purdue U., Lafayette, Ind.
SYNTHESIS OF CELL WALL CONSTITUENTS BY PENICILLIUM CHRYSOGENUM, by George W. Jourdian. Doctoral thesis. Aug 58, 149p. 213 refs.

## Pathology

BNL-733(T-263) $0.50

Brookhaven National Lab., Upton, N. Y.
EXCESSIVE SALT INTAKE AND HYPERTENSION: A DIETARY AND GENETIC INTERPLAY, by Lewis K. Dahl. Brookhaven lecture series no. 12. 13 Dec 61, 14p. 18 refs.

PB 160 068 $1.60

Naval Medical Research Inst., Bethesda, Md.
THE RELATIONSHIP BETWEEN THE FEVER CAUSED BY BACTERIAL PYROGENS AND THE FEVER OF ACUTE INFECTIONS, by Ivan L. Bennett, Jr. and Barton S. Holderman. Rept. no. 1 on Project NM 007 047. 11 Mar 48, 20p. 9 refs.

DESCRIPTORS: *Immunology, *Pyrogens, *Bacteria, Salmonella, Escherichia, Pneumococcus, Fevers.

The relationship between the fever of acute bacterial infection and that following injection of bacterial pyrogens was investigated by administering Salmonella typhi and Escherichia coli vaccines to rabbits convalescent from acute infections and recording temperature responses to these pyrogenic materials. It was found that animals recovering from dermal infection with Diplococcus pneumoniae, Type I, which produced little pyrogen by the tests employed, and animals recovering from peritonitis due to E. coli, a potent producer of pyrogen, showed no tolerance to the fever-promoting effect of these vaccines. Animals given daily injections of vaccine during infection developed tolerance in a normal manner. It was concluded that bacterial pyrogens probably play little or no role in the production of the fever accompanying infection. (Author)

PB 160 070 $3.60

Naval Medical Research Inst., Bethesda, Md.
THE RELATIVE SUSCEPTIBILITIES OF THE COMMONLY-USED LABORATORY MAMMALS TO INFECTION BY SCHISTOSOMA MANSONI, by M. A. Stirewalt, Robert E. Kuntz, and A. S. Evans. Rept. on Project NM 005 048.02.25. 8 Aug 50, 40p. 14 refs.

DESCRIPTORS: *Parasitic infections, *Schistosomiasis, Worms, *Trematodes, *Laboratory animals, Mammals, Resistance, Reaction (Physiology).

Eight species of animals have been studied as laboratory hosts for a strain of schistosoma mansoni from Puerto Rico. Golden hamsters, albino mice, and cotton rats have been judged satisfactory hosts for the maintenance of the parasite in the laboratory, providing numerous well-developed adult worms and passing viable ova in feces. Mice are especially recommended for chemotherapeutic studies because of the similarity of the pathology observed in them to that in man. Among these hosts, the parasites are most easily recovered from albino mice, white mice and hamsters a are most easily cared for. Host fatalities are fewest in cotton rats. Cats, guinea pigs, rabbits, albino rats, and dogs are unfavorable in one or more considerations.

PB 160 079 $2.60

Naval Medical Research Inst., Bethesda, Md.
A REVIEW OF THE LITERATURE ON SUSCEPTIBILITY OF MOSQUITOES TO AVIAN MALARIA, WITH SOME UNPUBLISHED DATA ON THE SUBJECT, by Clay G. Huff. Vol. 12, p. 619-644. 17 Dec 54, 27p. 65 refs. Research rept. on Project NM 005 048.01.10.

DESCRIPTORS: *Malaria, *Birds, *Mosquitoes, Plasmodium, Culex, Diseases carriers.

More than 50 years of work on the susceptibility and vector ability of the various species of mosquitoes to the avian malarial parasites of the genus Plasmodium is reviewed, tabulated and analyzed. In addition, numerous unpublished results in this field obtained by the writer are included. Susceptible mosquitoes are now known for 11 of the 17 known species of avian malaria. Ninety-one of the 147 combinations of mosquito species with parasite species have possible infection represented. The percentages of species of the following genera found to be susceptible to at least one species of Plasmodium are: Anopheles, 44 percent; Culiseta, 71 percent; Aedes, 59 percent; Armigeres, 83 percent; and Culex, 70 percent. With due caution for the small proportion of the possible combinations of host, mosquito and parasite and the small numbers represented in many of the tests, certain systematic relationships are indicated within the genus Plasmodium and among the genera of CULICIDAE. It is believed that the hypothesis that the association between species of Plasmodium and species of CULICIDAE antedates much of the speciation within both of these groups is somewhat strengthened by an overall view of the known susceptibilities of contemporary species of mosquitoes to species of Plasmodium. (Author)

PB 160 080 $1.60

Naval Medical Research Inst., Bethesda, Md.
THE ROLE OF THE STOMACH WALL IN THE EXOGENOUS DEVELOPMENT OF PLASMODIUM GALLINACEUM AS STUDIED BY MEANS OF HAEMOCOEL INJECTIONS OF SUSCEPTIBLE AND REFRACTORY MOSQUITOES, by A. Burns Weathersby. Vol. 10, p. 303-318. 20 May 52, 16p. 9 refs.
Research rept. on Project NM005 048.20.01.

DESCRIPTORS: *Stomach, Plasmodium, Malaria, *Mosquitoes, Culex, Salivary glands, *Spores.

The exogenous stages of Plasmodium gallinaceum are introduced artificially, by means of glass micro pipettes, into the haemocoels of susceptible Aedes aegypti and refractory Culex pipiens; thus by-passing the critical stomach wall phase. Infected salivary glands are demonstrated in 45 out of 201 A. aegypti surviving from 1680 so infected. All exogenous stages from gametocytes to mature sporozoites produce infections. No sporozoites are demonstrated in the glands of 304C. pipiens surviving from 2362 individuals injected. These results indicate that the factors responsible for the parasite's development in susceptible mosquitoes or for its death in refractory ones are not confined to the stomach wall, but this organ is merely the first intimate association between the parasite and the new host. (Author)

PB 160 421 $1.60

Naval Medical Research Inst., Bethesda, Md.
STUDIES ON FECAL DISSEMINATION ABOARD SHIP USING BACILLUS GLOBIGII AS A TRACER ORGANISM, by C. H. Miller, L. A. Barnes and others. Vol. 13, p. 225-234. 25 May 55, 11p. 2 refs.
Research rept. on Project NM 005 048.04.17.

DESCRIPTORS: Contamination, Ships, *Metabolic products, *Shigella infections, Bacillus subtilis, Epidemiology, Infections, Intestines, Bacteria.

Spore suspensions of Bacillus globigii were used to contaminate various surfaces and objects in the laboratory in order to standardize sampling technics and evaluate spore recovery rates prior to feeding spore suspensions to shipboard volunteers in an attempt to trace possible routes of fecal dissemination It was found that recovery of spores from directly contaminated surfaces and objects was satisfactory, whereas recovery from indirectly contaminated surfaces and objects was very low. Shipboard studies on volunteers excreting B. globigii labeled feces demonstrated that dissemination to commode seats, wash basins and, in two instances each, other individuals and berthing spaces occurred. Investigations on shipboard laundry operations showed that indirect contamination of the laundrymen's hands and working surfaces in contact with soiled clothing could be demonstrated in every instance. It is believed that if more efficient sampling methods had been available, even wider fecal dissemination might have been observed. (Author)

PB 160 424 $1.60

Naval Medical Research Inst., Bethesda, Md.
STUDIES ON THE EXOERYTHROCYTIC STAGES OF PLASMODIUM GALLINACEUM DURING THE "TRANSITIONAL PHASE", by Clay G. Huff. Vol. 10, p. 397-414. 19 May 52, 18p. 9 refs. Research rept. on Project NM 005 048.01.03.

DESCRIPTORS: Parasites, Blood, *Plasmodium, *Erythrocytes, Malaria, *Viability.

The following observations upon the exoerythrocytic stages of Plasmodium gallinaceum in chicks were made during the stage of infection in which there was a sudden shift from tissue parasitism to parasitemia (the "transitional stage"): 1. The relative frequency of exoerythrocytic stages in the organs, expressed as number of parasites per square millimeter of sections, was fairly consistent in the two birds studied except for kidney and spleen. 2. At the time when the preponderance of parasites in the fixed tissue consisted of large schizonts and segmenters, the preponderance of erythrocytic parasites consisted of young trophozoites. 3. Degenerative changes in the exoerythrocytic stages, possibly due to the development of antibodies by the host, were seen as early as 53 hours after the first observed parasitemia. 4. Differences in size of the exoerythrocytic merozoites were found to be distributed in a statistically normal manner.

PB 160 434 $1.60

Naval Medical Research Inst., Bethesda, Md.
STUDIES ON THE USE OF SIMULANTS FOR THE INVESTIGATION OF METHODS OF SPREAD OF ENTERIC ORGANISMS, by Robert L. Magoffin, Howard Karl Sessions and others. Vol. 11, p. 1245-1258. 3 Dec 53, 14p. 10 refs. Research rept. on Project NM 005 048.04.16.

DESCRIPTORS: *Epidemiology, *Diseases, *Intestine, Contamination, Metabolic products, Bacillus subtilus.

Evidence has accumulated that direct person to person transmission is an important mode of spread of bacillary dysentery. In order to evaluate the various possible mechanisms by which an infected individual might disseminate enteric organisms in his environment and transmit them to his associates, a simple method of tracing the dispersion of fecal matter from a single individual is needed. These studies were designed to evaluate various substances which might serve to label the feces and simulate the spread of enteric pathogens. Materials studied included: (1) water soluble dyes such as crystal violet, safranin, and fluorescein, adsorbed to activated charcoal for passage through the gastrointestinal tract; and (2) water-insoluble dyes, carmine, and Sudan III. Two chromogenic organisms, Bacillus globigii and Serratia marcescens, were studied. Each agent was given orally to cats and some were subsequently ingested by a human volunteer. The charcoal-adsorbed dyes were readily excreted in the feces but were relatively insensitive in comparison with the organisms for the detection of minute traces of pollution. B. globigii when ingested in sufficient numbers was comparable in sensitivity to coliform organisms as an indicator of fecal contamination, but did not multiply in the gastrointestinal tract. (Author)

PB 160 448 $1.60

Naval Medical Research Inst., Bethesda, Md.
THE SUSCEPTIBILITY OF ALBINO RATS TO SCHISTOSOMA MANSONI, by M. A. Stirewalt, A. S. Evans, and Robert E. Kuntz. Rept. no. 20 on Project NM 005 004 (X-535) 18 Nov 48, 14p. 7 refs.

DESCRIPTORS: *Parasitic infections, *Schistosomiasis, Worms, *Trematodes, *Laboratory animals, Rats, Resistance, Reaction (Physiology).

An evaluation has been made of the albino rat as a definitive host for Schistosoma mansoni. It was found to be unsuitable for maintenance of the life cycle of the parasite in the laboratory, chiefly since viable ova are not extruded in the feces, and for the provision of adequate numbers of well-developed adult worms and ova for special investigations. It was considered a favorable mammal in which to study host resistance to S. mansoni. Variations in cercarial infectivity have been noted. (Author)

## Radiobiology

UCD-106 $2.50

California U., Davis. School of Veterinary Medicine.
THE EFFECTS OF CONTINUAL $Sr^{90}$ INGESTION DURING THE GROWTH PERIOD OF THE BEAGLE AND ITS RELATION TO $Ra^{226}$ TOXICITY. Annual progress rept. no. 5, AEC project no. 6, on Contract AT(11-1)-GEN-10. June 62, 139p. 52 refs.

UCD-105 $3.50

California U., Davis. School of Veterinary Medicine.
THE EFFECTS OF X-RADIATION ON WORK CAPACITY AND LONGEVITY OF THE DOG. Annual progress rept. no. 11, on Contract AT(11-1)-GEN-10. June 62, 271p. 80 refs.

UCLA-505 $0.50

California U., Los Angeles. School of Medicine.
A DEVICE FOR CONTAMINATING GRAINS WITH RADIOACTIVE MATERIAL, by Theodore Y. Tagami. Rept. on Contract AT(04-1)-GEN-12. June 62, 15p.

UCLA-507 $8.60

California U., Los Angeles. School of Medicine.
SEMIANNUAL PROGRESS REPORT. Rept. for period ending 30 June 62, on Contract AT(04-1)-GEN-12. 98p. 44 refs.

TID-16160 $1.10

Colorado U. Medical Center, Denver.
CHEMICAL PROTECTION OF MICE FOLLOWING TOTAL BODY X-IRRADIATION, by Edward D. Coen and Richard W. Whitehead. Rept. on Contract AT(11-1)-394. [1961] 9p. 6 refs.

UCRL-10181 $0.50

Lawrence Radiation Lab., U. of California, Berkeley.
EFFECTS OF GLYCEROL AND OF ANOXIA ON THE RADIOSENSITIVITY OF HAPLOID YEASTS TO DENSELY IONIZING PARTICLES, by Thomas R. Manney, Tor Brustad, and C. A. Tobias. Rept. on Contract W-7405-eng-48. 18 Apr 62, 24p. 22 refs.

PB 160 056 $1.60

Naval Medical Research Inst., Bethesda, Md.
RADIAL X-RAY BEAM CHARACTERISTICS AT 230 K. V. P., by F. W. Chambers, Jr., J. E. Morgan, and J. T. Istock. Research rept. on Project NM 006 012.04.39. 21 Aug 51, 13p. 4 refs.

DESCRIPTORS: *Electronic tubes, *X-rays, Voltage, *Therapy, X-ray generators, *Radiation effects

Some quantitative characteristics of the radial beam from a specially modified (90° anode) G. E. "Maxitron" therapy unit are presented. This design, offering an effectively uniform cylindrical field of relatively large area, has been found inherently suited to simultaneous exposure techniques in lethal dose experiments. Significant physical factors at 230 K. V. P., 25 M. A., and 100 cm. anode distance are summarized. (Author)

PB 160 057 $1.60

Naval Medical Research Inst., Bethesda, Md.
RADIATION DOSIMETRY IN BIOLOGICAL RESEARCH, by J. E. Morgan and F. Ellinger, Vol. 13, p. 861-878. 9 Dec 55, 19p. 5 refs. Research rept. on Project NM 006 012.04.92.

DESCRIPTORS: *Medical equipment, Radiation instruments, *Dosimeters, *X-ray generators, *Gamma emission, Radiation effects, Therapy, Cobalt, Radioactive isotopes.

Some special physical problems and techniques involved in the measurement and delivery of precisely standardized doses of x and γ radiation are discussed. The fact that a higher order of dosimetric accuracy is essential for radiobiological laboratory experiments than for routine clinical therapy is emphasized. Difficulties in extending application of the roentgen unit to higher photon energies, some mechanical and electrical inadequacies found in commercial x ray and dosimetric equipment, and marked improvements obtained by the use of relatively simple accessories are reported. Special reference is made to the unusual problems encountered in operating a 2,400 c $Co^{60}$ irradiator of spherical configuration. (Author)

NYO-2760 $14.00

New Jersey State Dept. of Health, West Orange.
RESUMES OF FINDINGS FROM INDIVIDUAL CASE STUDIES: EPIDEMIOLOGICAL FOLLOW UP OF RADIUM CASES, by Lester A. Barrer, Hyman W. Fisher and others. Progress rept. on Contract AT(30-1)-2181. 1 July 62, 217p.

UR-613 $1.50

Rochester U. School of Medicine and Dentistry, N. Y.
MODIFICATION OF THE BECKMAN MODEL DU SPECTROPHOTOMETER FOR USE AS A SEMI-AUTOMATIC PAPER CHROMATOGRAPHIC STRIP SCANNING AND RECORDING INSTRUMENT, by Frank Ganis, Franklin Brayer and others. Rept. on Contract W-7401-eng-49. 31 July 62, 68p. 18 refs.

## CHEMISTRY

IS-470 $0.75

Ames Lab., Iowa State U. of Science and Tech.
REMOVAL OF PLUTONIUM FROM URANIUM BY MOLTEN METAL EXTRACTION, by A. F. Voigt, R. G. Clark and others. Rept. on Contract W-7405-eng-82. May 62, 32p. 9 refs.

ANL-6362 $2.25

Argonne National Lab., Ill.
THE DISTILLATION OF URANIUM HEXAFLUORIDE AND BROMINE PENTAFLUORIDE IN A 0.5-INCH-DIAMETER PACKED COLUMN, by Richard O. Ivins. Rept. on Contract W-31-109-eng-38. May 62, 103p. 41 refs.

NAA-SR-6734 $0.50

Atomics International, Canoga Park, Calif.
HYDROGEN FORMATION IN THE RADIOLYSIS OF TOLUENE, by R. B. Ingalls. Rept. on Contract AT(11-1)-GEN-8. 30 July 62, 17p. 12 refs.

BMI-1585 $0.50

Battelle Memorial Inst., Columbus, Ohio.
REACTIONS BETWEEN URANIUM OXIDE AND BIVALENT METAL OXIDES AT 60,000 ATM, by Arthur P. Young and Charles M. Schwartz. Rept. on Contract W-7405-eng-92. 10 July 62, 13p. 17 refs.

UCRL-10179 $0.50

Lawrence Radiation Lab., U. of California, Berkeley.
THE IMPURITY OF SCIENCE, by Melvin Calvin. Rept. on Contract W-7405-eng-48. 19 Apr 62, 19p.

UCRL-10048 $2.00

Lawrence Radiation Lab., U. of California, Berkeley.
SEPARATION OF IMMISCIBLE LIQUIDS BY GRAVITY SETTLING AND INDUCED COALESCENCE, by Robert J. Graham. Master's thesis. Rept. on Contract W-7405-eng-48. 5 Feb 62, 91p. 51 refs.

LA-2665 $1.00

Los Alamos Scientific Lab., N. Mex.
INTERMOLECULAR POTENTIAL FUNCTIONS FOR SOME SIMPLE MOLECULES FROM AVAILABLE EXPERIMENTAL DATA, by Wildon Fickett. Rept. on Contract W-7405-eng-36. 23 July 62, 42p. 23 refs.

MCW-1470 $1.25

Mallinckrodt Chemical Works, Weldon Spring, Mo.
PRODUCTION OF URANIUM DIOXIDE BY FLAME DENITRATION AND REDUCTION OF AQUEOUS URANYL NITRATE, by W. H. Hedley, R. J. Roehrs. and W. T. Trask. Rept. on Contract W-14-108-eng-8. 22 June 62, 49p.

ORNL-2971(Vol. 3) $2.75

Oak Ridge National Lab., Tenn.
BIBLIOGRAPHY ON NUCLEAR REACTOR FUEL REPROCESSING AND WASTE DISPOSAL. VOLUME 3: FISSIONABLE MATERIAL RECOVERY, by T. F. Connolly. 164p.

ORNL-2971(Vol. 4) $3.50

Oak Ridge National Lab., Tenn.
BIBLIOGRAPHY ON NUCLEAR REACTOR FUEL REPROCESSING AND WASTE DISPOSAL. VOLUME 4: HAZARDS AND PROTECTION 4.00, by T. F. Connolly. 246p.

IDO-14582 $0.75

Phillips Petroleum Co., Idaho Falls.
SODIUM FLUOZIRCONATE PRECIPITATION PROCESS FOR ZIRCONIUM FUELS. PART I. LABORATORY DEVELOPMENT, by B. J. Newby. Rept. on Contract AT(10-1)-205. 15 May 62, 34p. 6 refs.

RAI-101 $4.60

Radiation Applications, Inc., Long Island City, N. Y.
FOAM SEPARATION, by Eliezer Rubin, Ernest Schonfeld, and Richard Everett, Jr. Quarterly progress rept. 1 Jan-31 Mar 62, on Subcontract 2024. 2 May 62, 45p. 5 refs.

## Analytical Chemistry

NASA N62-15318 $3.60

Houston U., Tex.
A SENSITIVE IONIZATION CROSS-SECTION DETECTOR FOR GAS CHROMATOGRAPHY, by J. E. Lovelock, G. R. Shoemake, and A. Zlatkis. Rept. on Grant NsG-199-62. [1962] 34p. 8 refs.

UCRL-6873 $2.25

Lawrence Radiation Lab., U. of California, Livermore.
CHEMICAL ANALYSES OF PLUTONIUM AND PLUTONIUM ALLOYS: METHODS AND TECHNIQUES. A literature search covering 1950-July 61, by Rose Kraft, Carl J. Wensrich and Arthur L. Langhorst, Jr. Rept. on Contract W-7405-eng-48. 11 Apr 62, 35p.

UCRL-6903 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
THE SPECTROPHOTOMETRIC DETERMINATION OF SOME NITRO AND NITROSO DERIVATIVES OF DIPHENYLAMINE IN N, N-DIMETHYLFORMAMIDE, by Walter Selig. Rept. on Contract W-7405-eng-48. 8 May 62, 15p. 8 refs.

NASA N62-14862 $0.50

Lewis Research Center, National Aeronautics and Space Administration, Cleveland, Ohio.
ANALYSIS OF FLUORINE GAS BY REACTION WITH MERCURY, by Robert E. Seaver. Aug 62, 7p. 3 refs. NASA TN D-1412.

LA-2691 $0.50

Los Alamos Scientific Lab., N. Mex.
AN APPARATUS FOR THERMOGRAVIMETRIC ANALYSIS IN CONTROLLED ATMOSPHERES, by Earl L. Head and Charles E. Holley, Jr. Rept. on Contract W-7405-eng-36. 31 July 62, 20p. 2 refs.

Y-1394 $0.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
FLAME PHOTOMETRIC DETERMINATION OF SODIUM AND POTASSIUM IN BERYLLIUM METAL, by R. E. Barringer. Rept. on Contract W-7405-eng-26. 1 May 62, 23p. 6 refs.

## Organic Chemistry

NYO-10177 $2.60

Consolidation Coal Co., Library, Pa
DEVELOPMENT OF TRITIUM LABELING OF ORGANIC MATERIALS, by P. M. Yavorsky and E. Gorin. Quarterly technical status rept. no. 1, 1 Mar-31 May 62, on Contract AT(30-1)-2976. 1 July 62, 25p. 5 refs.

PB 160 993 $3.60

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
THE CARBIDES OF URANIUM: UC, $UC_2$, AND $U_2C_3$. 15 Sep 47, declassified 20 May 59. 36p. 32 refs. Rept. no. NEPA 273-EMR-12.

DESCRIPTORS: *Uranium compounds, *Carbides, Chemical properties, Physical properties, Metallurgy, Preparation, Analysis, Chemical equilibrium, Radiation effects

Contents:
Property data
Fabrication data
Preparation
Analysis
Equilibrium studies with other elements and compounds
Structural studies and changes in properties under exposure to radiation
Nuclear data
Bibliography

## Physical Chemistry

PB 162 066 $2.60

Amherst Coll., Mass.
THERMODYNAMIC PROPERTIES OF THE ELECTRICAL DOUBLE LAYER, by David C. Grahame. Technical rept. no. 6 on Contract N8onr-66903. 25 May 51, 29p. 15 refs. ATI-123 210.

DESCRIPTORS: *Electrical double layer, Thermodynamics, Electrochemistry, Ions, Mercury electrodes, Electrolytes.

The theory of the electrical double layer is discussed, with particular emphasis on those points for which the Stern theory is in need of modification. These are three in number as follows: (1) the distance of closest approach of anions is, in general, less than that of cations; (2) the specific adsorption potential $\emptyset$ is not independent of the polarization potential; and (3) there is no specific adsorption of either cations or anions when $\emptyset = 0$. Data are presented showing the effect of temperature on the capacity of the double layer at a mercury-solution interface in one normal KCl. New data are also presented on the capacity of the double layer at a mercury-solution interface at 25°C when the solution in question was 1 N KCl, 0.01 N KCl, 0.001 N KCl, 0.1 N LiCl, 0.1 N CsCl, and 0.1 N $LaCl_3$.

BMI-1587 $0.50

Battelle Memorial Inst., Columbus, Ohio.
HELIUM SOLUBILITY IN $D_2O$ AT ELEVATED TEMPERATURES AND PRESSURES, by Elmer F. Stephan. Warren E. Berry, and Frederick W. Fink. Rept. on Contract W-7405-eng-92. 23 July 62, 13p. 6 refs.

UCRL-6655 (rev. 1) $0.50

Lawrence Radiation Lab., U. of California, Livermore.
THE DIFFUSION OF COBALT INTO PURE ALPHA IRON, by Richard J. Borg and David Y. F. Lai. Rept. on Contract W-7405-eng-48. 9 Apr 62, 11p. 8 refs.

UCRL-6872 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
THE DIFFUSION OF GOLD INTO PURE ALPHA IRON, by R. J. Borg and David Y. F. Lai. Rept. on Contract W-7405-eng-48. 28 May 62, 8p. 6 refs.

UCRL-6918 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
THE DIFFUSION OF NICKEL IN PURE ALPHA IRON, by David Y. F. Lai and Richard J. Borg. Rept. on Contract W-7405-eng-48. 25 May 62, 11p. 12 refs.

UCRL-10135 $2.50

Lawrence Radiation Lab., U. of California, Berkeley.
KINETIC STUDIES OF THE REACTIONS OCCURRING BETWEEN TUNGSTEN AND GASES AT LOW PRESSURES AND HIGH TEMPERATURES, by Harlan Urie Anderson. Doctoral thesis. Rept. on Contract W-7405-eng-48. Apr 62, 140p. 50 refs.

UCRL-6865 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
THE SELF DIFFUSION OF IRON IN DELTA IRON, by Richard J. Borg, David Y. F. Lai, and Oscar Krikorian. Rept. on Contract W-7405-eng-48. 23 Mar 62, 18p. 8 refs.

UCRL-9987 $1.75

Lawrence Radiation Lab., U. of California, Berkeley.
STEADY STATE DIFFUSION IN TERNARY GAS MIXTURES, by Richard W. Getzinger. Master's thesis. Rept. on Contract W-7405-eng-48. 17 Jan 62, 71p. 17 refs.

PB 162 213 $3.60

Pacific Semiconductors, Inc., Culver City, Calif.
STUDY OF SURFACES IN SEMICONDUCTOR DEVICES, by J. M. Crishal, T. C. Hall and others. Quarterly technical rept. no. 1, 1 Apr-30 June 57, on Contract DA 36-039-sc-73229. [1957] 33p. Rept. no. 300811-3-Q; AD-140 461.

DESCRIPTORS: *Semiconductors, Surface properties, Films, Oxidation, Electrochemistry, Transistors, Electron tubes, Silicones, Polymers.

Theoretical and experimental studies are to be made of those semiconductor surface phenomena which limit the fabrication, performance, and reliability of semi-conductor devices. Improved performance and reliability will be sought by the synthesis of surface films of specific and known chemical and physical properties. Surface passivation was attempted by dense chemically bonded film structures. Attempts to produce polysiloxane films from commercially available (Dow Corning 703) partly polymerized silicone oils by further polymerization were encouraging. Such films were successfully applied as masking agents in the production of diffusion structures. The silica film was generated by subjecting a previously CP-4 etched Si sample to a flowing gas stream which consisted of 200 mm of $O^3$, 20 mm of $H_2O$ and 50 mm of $SiCl_4$ (each with saturation pressure at 25°C), and $O_2$ to produce one atmosphere total pressure. The sample was supported on an Au sheet and induction heated to 300°C for 15 min, after which the surface showed a blue interference color. Angle lapping measurements indicated that the film was 0.7 $\mu$ thick, which established the blue interference color as probably second order. Construction was initiated on a flying light spot scanner for evaluating surfaces. The instrument is to consist of an illuminator and a viewer. The illuminator will be a

high-intensity projection CRT to provide a light spot which may be readily moved for the scanner operation.

PB 160 447 $1.60

Naval Medical Research Inst., Bethesda, Md.
SURFACE DIFFUSION AND THERMAL TRANSPIRATION IN FINE TUBES AND PORES, by Terrell L. Hill. Vol. 14, p. 15-30. 12 Jan 56, 16p. 11 refs. Research rept. on Project NM 000 018.06.47.

DESCRIPTORS: *Surface properties, Porosity, Diffusion, Evapotranspiration, Adsorption, Theory, Temperature, Pressure, Mathematical analysis.

The role of surface transport in the passage of a gas at low pressure through fine tubes or pores is examined in terms of simple models of mobile and localized adsorption. The amount of surface transport becomes about equal to the amount of gas transport when the tubes or pores have radii of the order of several hundred Angstrom units. The theory predicts that surface transport will have little effect on the pressure gradient across the tube or pores in the absence of a temperature gradient. But the pressure gradient should be increased considerably, as a result of surface transport, over the usual (thermal transpiration) pressure gradient when there is a temperature gradient across the tube or pores. (Author)

ORNL-TM-302 $1.10

Oak Ridge National Lab., Tenn.
PREPARATION OF HIGH-PURITY MAGNESIUM OXIDE, by R. B. Quincy, Jr. 15 Aug 62, 6p.

PB 162 146 $7.60

Purdue Research Foundation, Lafayette, Ind.
A STUDY OF FLAME TEMPERATURES AS DETERMINED BY THE SODIUM LINE REVERSAL METHOD IN TOTALLY AND PARTIALLY COLORED FLAMES, by H. J. Buttner, I. Rosenthal, and W. G. Agnew. Rept. on Contract N6ori-104, T.O. 1. 1 Sep 49, 77p. 16 refs. Proj. Squid Technical memo. no. PUR-13; AD-39 617.

DESCRIPTORS: *Flames, Analysis, Temperature, Colors, *Sodium compounds, Chlorides.

## EARTH SCIENCES

TEI-776 $4.60

Geological Survey, Washington, D.C.
INTERIM GEOLOGICAL INVESTIGATIONS IN THE U12e.04 TUNNEL, NEVADA TEST SITE, NYE COUNTY, NEVADA, by W.L. Emerick, D.D. Dickey, and F.A. McKeown. Preliminary rept. July 62, 50p. 9 refs.

PB 162 067 $2.60

Harvard U., Cambridge, Mass.
TOWARD A MORE ANALYTICAL ECONOMIC GEOGRAPHY: THE ANALYSIS OF FLOW PHENOMENA, by Edward L. Ullman and Walter Isard. Rept. no. 1 on Studies in Transportation Geography, Contract N5ori-07633. June 61, 29p. 15 refs. ATI-210 011.

DESCRIPTORS: *Economics, *Geography, Transportation.

NASA N62-14700 $2.50

Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
THE GRAVITATIONAL FIELD ENVIRONMENT OF AN EARTH SATELLITE, by David Adamson. Aug 62, 118p. 22 refs. NASA TN D-1270.

PB 162 079 $5.60

Marine Lab., U. of Miami, Coral Gables, Fla.
[RESULTS OF ELEVEN OCEANOGRAPHIC CRUISES] by Frank Chew and L. P. Wagner. Technical rept. 25 June-7 May 57, on GEK Data Investigation, Contract Nonr-84001. [1957] 55p. AD-206 541.

DESCRIPTORS: *Ocean currents, *Florida straits, Oceanographical data, Analysis.

Eleven cruises were undertaken to study the kinematics, dynamics and ultimately the variation in the heat transport of the Florida current. The forces to be included in the equation of motion other than the pressure gradient and Coriolis, are investigated through the study of the kinematics of the current. GEK data was collected for the following purposes: (1) to determine the best estimate of the instantaneous current at a locality, and (2) to determine the total transport of the Florida current off Miami. Tabulations are presented of all GEK and hydrographic data accumulated during the investigation.

### Climatology and Meteorology

BNL-718(T-254) $1.00

Brookhaven National Lab., Upton, N.Y.
A STUDY OF THE WIND PROFILE IN THE LOWEST 400 FEET OF THE ATMOSPHERE, by Irving A. Singer and Constance M. Nagle. Final rept. 31 Mar 62, 28p. 14 refs.

NASA N62-14921 $1.00

Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
TELEMETERING INFRARED DATA FROM THE TIROS METEOROLOGICAL SATELLITES, by J. F. Davis, R. A. Hanel and others. Aug 62, 42p. 9 refs. NASA TN D-1293.

PB 162 220 $4.60

Massachusetts Inst. of Tech., Cambridge.
QUANTITATIVE MAPPING OF RADAR WEATHER, by Mobuhiko Kodaira. Research rept. no. 30 on Weather Radar Research, Contract DA 36-039-sc-75030. June 59, 49p. 37 refs. AD-228 154.

DESCRIPTORS: *Meteorological radar, Meteorological instruments, *Radar signals, Intensity, *Precipitation, Measurement.

Instrumentation is described which (1) averages the rapidly fluctuating radar video signals from weather, (2) applies an appropriate range correction to the signals, and (3) displays them on a PPI screen in the form of iso-echo contours. In order to provide the necessary dynamic range a logarithmic receiver is used. Signal averaging is accomplished by a quartz delay line integrator which superposes the signal from a number of consecutive pulses. The range correction unit normalizes the signal to a given range and compensates for atmospheric gas absorption. Examples of the measurements and estimates of the accuracy are presented. (Author)

## Physics of the Atmosphere

NASA N62-15194 $2.60

Committee on Space Research (COSPAR), The Hague (Netherlands).
ELECTROMAGNETIC AND CORPUSCULAR HEATING OF THE UPPER ATMOSPHERE, by Luigi G. Jacchia. [1962] 25p. 16 refs.

Presented at Third International Space Science Symposium and Fifth COSPAR Plenary Meeting, Washington, 30 Apr-9 May 62.

NASA N62-15216 $2.60

Committee on Space Research (COSPAR), The Hague (Netherlands).
ELECTRON LOSS RATE FROM THE OUTER RADIATION BELT, by W. N. Hess, S. Bloom and others. [1962] 21p. X-640-62-38.

Presented at Third International Space Science Symposium and Fifth COSPAR Plenary Meeting, Washington, 30 Apr-9 May 62.

NASA N62-15192 $1.60

Committee on Space Research (COSPAR), The Hague (Netherlands).
EVIDENCE FOR FIELD-ALIGNED IONIZATION IRREGULARITIES BETWEEN 200 AND 1000 KM ABOVE THE EARTH'S SURFACE, by Thomas E. VanZandt, Wynne Calvert and others. [1962] 17p. 5 refs.

Presented at Third International Space Science Symposium and Fifth COSPAR Plenary Meeting, Washington, 30 Apr-9 May 62.

NASA N62-15227 $4.60

Committee on Space Research (COSPAR), The Hague (Netherlands).
STRUCTURE OF THE UPPER ATMOSPHERE DEDUCED FROM CHARGED PARTICLE MEASUREMENTS ON ROCKETS AND THE EXPLORER VIII SATELLITE, by Robert E. Bourdeau and S. J. Bauer. [1962] 42p. 35 refs. X-615-62-18.

Presented at Third International Space Science Symposium and Fifth COSPAR Plenary Meeting, Washington, 30 Apr-9 May 62.

NASA N62-15878 $5.60

Geophysics Corp. of America, Bedford, Mass.
INSTRUMENTATION FOR THE DETERMINATION OF THE COMPOSITION OF THE UPPER ATMOSPHERE, by R. Herzog. Letter summary rept. (Final) on Contract NAS5-270. Dec 61, 60p.

NASA N62-10053 $3.60

High Altitude Engineering Lab., U. of Michigan, Ann Arbor.
UPPER AIR RESEARCH AT HIGH LATITUDES, by H. F. Allen. Quarterly progress rept. 1 Oct-31 Dec 61, on Contract NASw-115. Jan 62, 29p. 03433-9-P.

NASA N62-10058 $6.60

Iowa State U., Iowa City.
MEASUREMENTS OF THE INTENSITY AND SPECTRUM OF ELECTRONS AT 1000 KM ALTITUDE AND HIGH LATITUDES, by B. J. O'Brien, C. D. Laughlin and others. Rept. on Contract N9onr-938(03). Jan 62, 66p. 27 refs. SUI-62-3.

NASA N62-10054 $6.60

Iowa State U., Iowa City.
TIME VARIATIONS OF INTENSITY IN THE EARTH'S INNER RADIATION ZONE - OCTOBER 1959 THROUGH DECEMBER 1960, by Guido Pizzella. Doctoral thesis. Rept. on Contracts N9onr-938(03) and NASw-17. Feb 62, 61p. 38 refs. SUI-62-1.

PB 160 650 $6.50

Michigan U. Coll. of Engineering, Ann Arbor.
ATMOSPHERIC PHENOMENA AT HIGH ALTITUDES, by H. F. Allen, F. L. Bartman and others. Quarterly rept. no. 15, 1 Nov 58-31 Jan 59, on Contract DA 36-039-sc-64659. Mar 59, 69p. 1 ref. Rept. no. 2387-51-P; AD-218 341.

DESCRIPTORS: *Upper atmosphere, Atmosphere, Atmospheric sounding, *Sounding rockets, *Doppler tracking, *Doppler systems, *Grenades, Telemetering data, Ballistic cameras, Tracking, *Geophysics.

The DOVAP tracking and telemetering and ballistic camera tracking operation carried out on Guam for the IGY Guam rocket program is described. The tracking operation achieved 100% data recovery. The status of the reduction of the Fort Churchill IGY data is given together with recommendations for completing the work. The application of the LPG-30 computer to the geophysical research investigation is described.

NASA N62-10074 $1.60

Radioscience Lab., Stanford U., Calif.
THE EFFECT OF THE EARTH'S MAGNETIC FIELD ON MEASUREMENTS OF THE DOPPLER SHIFT OF SATELLITE RADIO TRANSMISSIONS, by Fernando de Mendonca and O. K. Garriott. Rept. on Grant NsG-30-60. Dec 61, 10p. 5 refs.

NASA N62-10073 $5.60

Radioscience Lab., Stanford U., Calif.
IONOSPHERIC ELECTRON CONTENT AND VARIATIONS MEASURED BY DOPPLER SHIFTS IN SATELLITE TRANSMISSION, by Fernando de Mendonca. Rept. on Grant NsG-30-60. Jan 62, 51p. 16 refs.

NASA N62-10072 $1.10

Radioscience Lab., Stanford U., Calif.
SEMIANNUAL STATUS REPORT. Rept. for 20 July 61-20 Jan 62 on Contract NsG-30-60. 15 Feb 62, 3p.

## ENGINEERING

PB 162 152 $1.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
INVESTIGATION OF UNPRESSURIZED SHELTER REQUIREMENTS AND EQUIPMENT, by J. J. Traffalis and W. R. Nehlsen. Interim rept. 18 May 55, 12p. Technical note no. N-221; AD-81 273.

DESCRIPTORS: *Shelters, Protective coverings, Construction, Air conditioning equipment, Decontamination.

A shelter kit is being developed for converting existing structures to unpressurized shelters which provide economical emergency atmospheric protection. The 2 types of unpressurized shelters are the unventilated, sealed shelter with oxygen supplied by chemicals and the ventilated, sealed shelter with a manually operated collective protector or diffusion barrier material. The unpressurized shelter facilities provide an enclosure which is CBR agent proof, decontaminates personnel upon entering, allows personnel to leave without contaminating the interior, supplies purified air to occupants, and provides personal necessities such as food, water, toilet facilities, and clothing. Methods of sealing include the use of cocoon material for the walls; covering the walls with a thin sheet of plastic, metal foil, asphalt paper, or vapor barrier material and taping all seams; and the use of tape, caulking compound, or cocoon material for the doors, windows, and cracks. An exploratory test was conducted to observe the conditions and reactions of personnel confined in an unpressurized, sealed shelter. Chemical control of air conditions can be accomplished, but the chemicals are expensive and create temperature-control problems. The manually operated collective protector is the most economical means for solving the problems of O, $CO_2$, temperature, humidity, and entrance and exit.

IDO-16753 $0.75

Phillips Petroleum Co., Idaho Falls.
UNITIZED MICROFILM SYSTEM FOR ENGINEERING DRAWINGS, by R. G. Masterson. Rept. on Contract AT(10-1)-205. 16 Apr 62, 27p.

## Aeronautical Engineering

PB 162 145 $5.60

Aeronautical Research Lab. [Office of Aerospace Research] Wright-Patterson AFB, Ohio.
A REVIEW OF THE PROBLEM OF ADHESION, by William M. Schofield and Stanley Czyzak. Interim rept. on A Quantum Mechanical Theory of Adhesion. Dec 52, 51p. 32 refs. WADC Technical rept. no. 52-69; AD-20 797.

DESCRIPTORS: *Adhesion, Theory, *Quantum mechanics, Molecules, Adhesives, Bonding, Metals, Aircraft equipment

It was shown that adhesion results can be obtained if certain parameters are chosen and the equations of adhesion are derived which utilize these parameters. In this method, certain physical considerations were ignored which accounted, in part, for the discrepancy between theory and experiment. A discussion is given of the importance of a fundamental approach to the problem of adhesion. The proper choice of the potential function is pointed out as an important factor in the adhesion problem. The ultimate strength of the adhesive bond is concluded to be the important factor in adhesion. The molecular interactions will enter the picture as rupture forces accompanied by a number of extraneous effects such as flaws, geometry

of the specimen, surface roughness, stress distribution, and ability of the joint to relieve stresses. It the classical conversion of energy of adhesion to rupture force were to hold reasonably well in all cases, it would be expected that large adhesion could be obtained in virtually any adhesive system provided the extraneous variables could be eliminated or minimized. There are instances where molecular forces are reflected in joint strength, particularly in the cases where H bonding exists. It appears that only relatively large inter-molecular forces are capable of overcoming the extraneous effects which frequently determine the joint strength. It is necessary to solve the molecular force problem as well as to determine the effects of the extraneous variables in order to obtain a clearer understanding of adhesion phenomena.

PB 162 149 $5.60

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PRESSURE DROP IN 5/16 INCH ALUMINUM TUBINGS AND FITTINGS, by Andrew J. Shine, Wallace V. Lukey and others. 2 Apr 56, 58p. WADC Technical rept. no 56-183; AD-101 276

DESCRIPTORS: *Gas flow, Pressure, *Aluminum tubing, *Pipe fittings, *Oxygen equipment, Design, Aircraft equipment.

The pressure drop in 5/16 inch diameter aluminum tubing, straight and bent, and in fittings used in aircraft oxygen-distribution systems has been determined experimentally. The results are presented in tabular form; one table for each section of tubing or fitting. Each table gives the pressure drop in pounds per square inch and in equivalent lengths of straight tubing for supply pressures of 5, 10, 15, 20, 25, 30, 60, and 400 pounds per square inch gage at flow increments of 5 liters per minute from 0 to 50, increments of 10 liters per minute from 50 to 100, and increments of 25 liters per minute from 100 to 400 liters per minute. (Author)

PB 162 223 $8.60

Airborne Instruments Lab., Inc., Mineola, N. Y.
ALL TYPE 2276-15 VELOCITY-SHAPING CANCELLER AND VIDEO INTEGRATOR, by S. F. Hall and A. E. Ruvin. Final engineering rept. vol. 2, on Contract AF 30(602)381. Mar 55, declassified. 94p. Rept. no. 2276-1; [RADC-TR-54-89]; AD-64 430.

DESCRIPTORS: *Video integration, Instrumentation, *Moving target indicators, Circuits

AD-277 468 repriced $3.00

Computer Engineering Associates, Inc., Pasadena, Calif.
OPTIMUM STRUCTURAL REPRESENTATION IN AEROELASTIC ANALYSES, by Robert G. Schwendler and Richard H. MacNeal. Final rept. 5 Oct 60-27 Oct 61, on Electronic Analog Computer Study of Approximate Flexible Airframe-Autopilot Transfer Functions, Contract AF 33(616)7658. Mar 62, 171p. 21 refs. ASD TR-61-680; NASA N62-13274.

DESCRIPTORS: *Airframes, Elasticity, *Aerodynamic configurations, Stresses, Structures, Stability, Control systems, Deformation, Vibration, Damping, Aerodynamics, Mathematical analysis, Matrix algebra, Analog systems, Analog computers.

An investigation of optimum methods for the mathematical representation of the structure of an airborne vehicle is described. Emphasis was placed on aeroelastic problems associated with stability and control, but the results and conclusions of the study are applicable to any aeroelastic problem. A method is presented whereby the elasticity of the structure is completely and rigorously included while the mass of the structure is expressed in terms of a finite number of normal coordinates of the system. Analog computer investigations of the dynamic response of three typical aircraft configurations were made using the method described. These analog computer investigations demonstrate the utility of the structural representation presented and also define the approximations which can be made in the representation in terms of the requirements of any particular analysis. (Author)

PB 181 403 $3.50

General Dynamics/Pomoma, Calif.
A CATALOG OF LARGE DISPLAY SYSTEMS, DEVICES, AND TECHNIQUES. Final rept. on Contract ARDS-426. May 62, 216p. 113 refs.

DESCRIPTORS: *Catalogs, *Display systems, Film projectors, *Air traffic control systems, Plan position indicators, Television display systems, Luminescence, Solid state physics, Electronic scanners, Optical equipment.

It is the purpose of this catalog to identify development and manufacturing sources of large display systems, devices, and techniques, which may be applicable for the display of a dynamic air traffic control situation. A description is provided of 40 display items reported by 34 companies engaged in applicable R & D. Also presented is certain information associated with development of these items, including sponsoring agency, known and suggested applications, status of R & D effort, and a brief resume of applicable company experience. Consistent with FAA requirements, the survey specifically excluded proprietary information ("material not protected by suitable patent"). In addition to large dynamic displays, descriptions are given of 9 three-dimensional dynamic display techniques, and 9 solid state module techniques which may be applicable to large status data displays. Included in the catalog is an alphabetical index of companies, addresses, and reported display items. A bibliography was compiled of technical literature of recent years relating to large displays. Also presented is a glossary of technical terms for convenient reference in the use of this catalog. (Author)

NASA N62-15161 $0.75

Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
FLIGHT INVESTIGATION OF THE LONGITUDINAL STABILITY AND CONTROL CHARACTERISTICS OF A FOUR-PROPELLER TILT-WING VTOL MODEL WITH A PROGRAMMED FLAP, by William A. Newsom, Jr. Sep 62, 26p. 4 refs. Technical note D-1390.

NASA N62-14920 $1.50

Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
LOW-SPEED WIND-TUNNEL INVESTIGATION TO DETERMINE THE FLIGHT CHARACTERISTICS OF A MODEL OF A PARAWING UTILITY VEHICLE, by Joseph L. Johnson, Jr. Aug 62, 56p. 4 refs. NASA TN D-1255.

PB 162 226 $41.00

Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
PROCEEDINGS OF THE SYMPOSIUM ON FATIGUE OF AIRCRAFT STRUCTURES, 11-13 AUGUST 1959. Oct 59, 1, 117p. WADC Technical rept. no. no. TR-59-507; AD-227 788.

DESCRIPTORS: *Aircraft materials, *Structures, Loading, Gust loads, *Fatigue (Mechanics), Airframes, Air Force logistics, Test methods, Symposia.

The General Session speeches point out the impact of fatigue on Air Force operations and present in detail the aircraft and personnel losses and related costs due to fatigue failures; the resulting supply, maintenance and logistic difficulties associated with fatigue problems; the effects of fatigue on the retaliatory potential of the military commands; and the philosophies and approaches of the military, government agencies and trade associations toward solving the fatigue problem. The seven papers of the first technical session deal with the analytical approach to the fatigue problem discussing all phases of analysis from statistical aspects of a load spectrum to stress concentration factors. The nine papers of Session II-A center about the problems of recognizing, measuring, and analyzing the aircraft loadings which produce critical fatigue damage. Papers of Session II-B delve into the material aspects of fatigue, covering such topics as the proper selection of materials for fatigue resistance, the importance of process control, high temperature considerations, and progressive damage theories. Session III papers expand on criteria to be used in the design of air and space vehicle and research objectives. The problems associated with simulation of fatigue load conditions in the laboratory are discussed in the papers of Session IV. Some of the problems included are: complete vehicle testing, sonic fatigue testing, fail safe test methods, elevated temperature testing and equivalent test spectrums. (Author)

PB 181 406 $2.25

Grace, W. R., and Co., Clarksville, Md.
REMOVAL OF SCALE-FORMING COMPOUNDS FROM SEA WATER. Rept. on Contract 14-01-001-202. Sep 62, 100p. 28 refs. Saline Water Research and Development Progress rept. no. 66.

DESCRIPTORS: *Sea water, *Scale, Countermeasures, Desalination, Phosphoric acids, Ammonia, Chemical reactions, Precipitation, Dehydration, Separation, Sodium compounds, Phosphates, *Fertilizers, Production, Economics, Feasibility studies, Water.

The process of descaling sea water by precipitation of the scale forming elements as phosphates has been successfully operated in a continuous manner producing descaled sea water and phosphate precipitates suitable for use as a high analysis fertilizer. The fertilizer produced in the process is premium quality because of its non-burning, non-leaching properties and its trace element content. Utilization of the continuous method should eliminate the need for the centrifuges originally assumed necessary to concentrate the slurry prior to filtration, thereby reducing the capital costs of the process considerably. Because the scale decreases the efficiency of the distillation equipment, use of descaled sea water would permit the equipment to be operated at higher temperatures. Smaller equipment could be utilized with considerable savings in capital costs. Although the descaled sea water has a greater value than the raw sea water, no credit has been taken toward the manufacturing costs of the fertilizer (produced in removing the scale-forming elements) for this increased value.

PB 181 407 $1.50

Tracor, Inc., Austin, Tex.
EFFECTS OF IMPRESSED ELECTROSTATIC FIELDS ON THE SALT WATER/AIR INTERFACE. Rept. for 5 Apr 60-30 June 62, on Contract 14-01-001-200. Sep 62, 56p. 20 refs. Saline Water Research and Development progress rept. no. 67.

DESCRIPTORS: *Electrostatic fields, *Electrochemistry, *Sea water, Water, Sodium compounds, Chlorides, Solutions, Air, Surface tension, Measurement, Electrodes, Vaporization, Freezing, Electric fields, Electrical effects, Thermodynamics.

The object of this contract was to study the influence of impressed electrostatic fields on the surface excess (or deficiency) of NaCl solutions up to sea water concentrations (3.5%). The surface concentration was investigated using surface tension measurements obtained with a surface energy balance in fields up to ±6700 v/cm. An attempt was made to measure directly the surface concentration change by using a skimming apparatus. It was concluded that surface concentration changes of NaCl solutions due to applied electrostatic fields, although qualitatively detectable, are too small to be measured quantitatively and are therefore unsuitable for practical desalination processes. Some methods other than the

ones mentioned above were tried and led to the same conclusion.

## Electrical and Electronic Engineering

PB 162 096 $5.60

American Research and Mfg. Corp. [Rockville] Md.
RAPID RESPONSE MAGNETIC AMPLIFIERS, by Peter H. Sawitz. Scientific rept. no. 1, 15 Jan-14 Apr 56, on Contract AF 33(616)3377. 51p. 249 refs. AD-92-448.

DESCRIPTORS: *Magnetic amplifiers, *Frequency multipliers, *Pulse generators, Transistors, Circuits, Design, *Bibliography.

A review reveals that all elements that will go into the complete rapid response units, namely the frequency multipliers, transistor multivibrators, and the magnetic amplifiers themselves of the proper characteristics, are currently being investigated by various researchers in the field. The performance of the various elements as reported in the literature falls somewhat short of the characteristics of the proposed models. A preliminary design was carried out on all elements to the point where tentative circuit diagrams were drawn. Experimental results were obtained on breadboard models of single-phase and three-phase triplers.

PB 162 085 $17.50

Armour Research Foundation, Chicago, Ill.
A STUDY OF CRYSTAL OSCILLATOR CIRCUITS, by H. E. Gruen and A. O. Plait. Final rept. 15 May 55-14 Aug 57, on Contract DA 36-039-sc-64609. [1957] 275p. AD-149 085.

DESCRIPTORS: *Oscillator circuits, Analysis, *Crystal oscillators, Radiofrequency oscillators, Design

See also PB 142 400.

AD-275 549 $21.00

Army Electronic Proving Ground, Fort Huachuca, Ariz.
INVESTIGATION OF MODEL TECHNIQUES. Final rept. 1958-1959. July 61, 394p. 150 refs. Rept. no. USAEPG-SIG 940-43R1.

DESCRIPTORS: *Communication systems, Communications theory, *Information theory, *Catalogs, Simulation, Electrical networks, Analysis, Theory, Algebras, Topology, Linear programming, Numerical methods and procedures, Digital computers, Analog computers, Thyratrons.

The objective is to develop a catalog of modeling techniques applicable to the simulation, analysis, and evaluation of communication systems under a variety of operational conditions, and to recommend the applications and sequence in which these techniques might be employed in the solution of various communication system problems. All known model techniques are to be investigated and, where applicable, new techniques and new applications of existing techniques are to be developed.

PB 160 959 $1.60

Battelle Memorial Inst., Columbus, Ohio.
THERMOELECTRIC POWER GENERATION AND RELATED PHENOMENA, by T. S. Shilliday. Bimonthly rept. no. 6, 7 Sep-7 Nov 59, on Contract NObs-77034. 21 Dec 59, 12p. 6 refs. AD-231 575.

DESCRIPTORS: *Thermoelectricity, Power, *Materials, Electrical properties, Metallurgical analysis, Metallic compounds, Alloys.

The preparation and characterization of AlAs-GaAs alloys are continuing with several different methods of preparation being investigated. Construction is virtually completed on the apparatus for electrical high-temperature measurements and well along on the thermal-diffusivity apparatus. No experimental work was done on the fundamental-properties investigation as activity was confined to a literature survey. (Author) (See also PB 160 958)

PB 162 155 $2.60

Carnegie Inst. of Tech., Pittsburgh, Pa.
RESEARCH LEADING TO THE DEVELOPMENT OF A SHIELDING EFFECTIVENESS TESTER, by Edward R. Schatz and Maurice E. Taylor. Quarterly progress rept. no. 3, 15 Dec 56-15 Mar 57, on Contract DA 36-039-sc-72308. [1957] 23p. AD-140 899.

DESCRIPTORS: *Electromagnetic shielding, Materials, Effectiveness, Test equipment.

Leakage data were taken on certain single-and double-braided co-axial cables using the tri-axial tester designed under this contract. In general, the data presented is for frequencies under one megacycle and is correlated with several possible methods of the leakage phenomenon. These different types of leakage are represented and discussed briefly. There is a complete description of tests performed with a damaged piece of single braid cable. The results reported indicate that the tri-axial tester offers a quick and easily - used method for comparing the leakage of several cables at frequencies for which the length of the tester is short compared to a wave length. (Author)

PB 162 218 $7.60

Cascade Research [Corp.] Los Gatos, Calif.
DEVELOPMENT OF MILLIMETER FERRITE DEVICES, by R. A. Henschke, H. K. Y. Hom, and R. L. Orrick. Final engineering rept. 15 Apr 57-15 Feb 59, on Contract DA 36-039-sc-73228. [1959] declassified 15 Aug 62. 70p. AD-222 190, formerly AD-312 563.

DESCRIPTORS: *Microwave equipment, *Ferrites, Radiofrequency attenuators, Transmission lines,

Switching circuits, Magneto-optic rotation, Phase shifters, Attenuation, Design.

The development of millimeter ferrite isolators, pulsed-attenuators, circulators, and a three-port switch was completed. Isolators were dielectric-loaded, resonance-type devices, and were designed to provide isolations greater than 20 db and insertion losses under 0.5 db when operated over either the upper or the lower half of the frequency band. The pulsed attenuators consisted of a cascaded pair of oppositely rotating 45° Faraday rotation elements. With this arrangement, the output polarization of the attenuator is parallel to the input polarization. Transverse-field, 4-port, circulators were developed using side-wall hybrids. In these devices, two 90° differential-phase-shifters were used together with a 90° reciprocal, dielectric phase shift compensator. A 3-port switch was designed to provide switching between one input and two outputs. Sidewall hybrids and Faraday rotation ferrite elements were used in a reciprocal configuration. It was concluded that useful ferrite devices could be constructed in the millimeter frequency range and that optimum designs could be achieved only through the choice of suitable ferrite materials. (See also AD-305 414)

PB 162 221 $15.50

Case Inst. of Tech., Cleveland, Ohio.
INVESTIGATION OF MODEL TECHNIQUES. Annual rept. no. 2, 1 July 57-30 June 58, on Contract DA 36-039-sc-67848. Oct 58, 235p. Rept. no. AEPG-SIB 940-43; AD-211 968.

DESCRIPTORS: Military communications, *Communication systems, *Communications theory, *Information theory, Catalogs, Model tests, Simulation, Effectiveness, Synthesis, Electrical networks.

Results are presented of a 2-yr investigation of models and modelling techniques applicable to the simulation, analysis, and evaluation of Army communication systems. The characteristics and uses of models and modelling techniques are discussed, and illustrations are presented of some of the different classes of models. Eleven criteria are defined for measuring communication systems effectiveness. The criteria listed are reliability, accuracy, capacity, speed, cost, flexibility, mobility, vulnerability, security, operational procedures, and connectivity. A catalog is presented of the models and modelling techniques investigated. An effort was made to state what each model and technique is, and what uses it has.

PB 162 157 $8.60

Edgerton, Germeshausen and Grier, Inc., Boston, Mass.
A STUDY OF RADIATION EFFECTS ON ELECTRONIC DEVICES, by Harold S. Sauer. Interim rept. no. 2, pt. 1, 1 Sep-30 Nov 59, on Contract DA 36-039-sc-78171. 14 Dec 59, 98p. EG&G rept. no. B-2000; AD-236 170.

DESCRIPTORS: *Electron tubes, *Transistors, Radiation damage, Tests, Test reactors, Triodes, Thyratrons.

At two pulsed nuclear reactors, Godiva and TRIGA, transient and long term measurements were made on a group of transistors and tubes subjected to a high intensity pulse of nuclear radiation. Very significant information was obtained. The response of transistors to the radiation pulse was found to be large and cleanly separable into parts, each proportional to the dose rate or integrated dose of the pulse. The gain of triodes was found to be definitely affected. The operation of the thyratrons tested was not disturbed by the radiation pulse from Godiva II and only slightly disturbed by that from TRIGA. (Author)

PB 162 081 $2.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
NON-PLANAR LOGRITHMICALLY PERIODIC ANTENNA STRUCTURES, by D. E. Isbell. Technical rept. no. 30 on Contract AF 33(616)3220. 20 Feb 58, 26p. AD-156 203.

DESCRIPTORS: *Slot antennas, Design, *Antenna radiation patterns, Measurement.

A method is described for obtaining unidirectional radiation patterns over unlimited bandwidths with a single radiating structure. The method is a natural extension of a technique which provides frequency independent bidirectional radiation patterns. The antenna was constructed as a slot in a ground plane. The general configuration is that of the compliment of a serrated bow tie antenna, i.e., the configuration which results when the metal and nonmetal portions of the plane are interchanged. The properties of the antenna were investigated as a function of the angle between the elements as they are rotated about the vertex out of the plane. Tests also indicated that excellent unidirectional broadband performance can be obtained for planar antennas with the elements inclined.

PB 162 108 $6.60

Electron Tube Lab., U. of Michigan, Ann Arbor.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF LARGE-SIGNAL TRAVELING-WAVE TUBES, by J. E. Rowe, H. Sobol, and C. Wen. Quarterly progress rept. no. 2, 1 Nov 56-1 Feb 57, on Contract AF 30(602)1596. [1957] 65p. Rept. no. 2562-2-P; RADC-TN-57-111; AD-114 368.

DESCRIPTORS: *Traveling wave tubes, Microwave equipment, Signals, Design

PB 162 225 $2.60

Hermann Foettinger Institute, Berlin (West Germany)
HOT-WIRE ANEMOMETER FOR MEASUREMENTS IN UNSTEADY FLOW, by O. Wehrmann and R. Wille. Rept. on Contract AF 61(514)808. [1955] 28p. 10 refs. Rept. no. [AFOSR-TN-56-26] AD-84 466.

DESCRIPTORS: *Anemometers, Germany, Instrumentation, Fluid mechanics, Aerodynamics, Electronic equipment

The hot-wire instrument utilizes carrier-frequency amplification and automatic control of the constant

wire temperature. The output is linearized. The following assemblies are provided: (1) an amplifier and demodulator stage for amplification and demodulation of the bridge voltage for obtaining an amplified dc voltage at the output proportional to the bridge voltage; (2) an oscillator, control, and power stage for generating a dc voltage with a constant amplitude and a low harmonic content, using the dc voltage produced by the assembly in the control stage for the modulation of the ac voltage supplied by the generator stage, and producing an output of 25 w in the power stage to meet measuring conditions; and (3) a linearizing stage for forming the logarithm inherent to the measuring value, multiplying this value with the desired exponent of the linearization function, forming the antilogarithm of this value, and amplifying the linearized function for immediate application to the deflecting plates of an oscillograph. The instrument was designed originally for measuring the periodical velocity changes in the scavenging ports of a model 2-stroke engine; an example of the application is given. Research studies in free-jet are using the instrument for determining the distribution of the mean velocity. The components of the anemometer are discussed separately.

PB 162 144 $11.50

Hermes Electronics Co., Cambridge, Mass.
PRODUCTION ENGINEERING MEASURE FOR QUARTZ CRYSTAL FILTER AND DISCRIMINATOR UNITS AT 10MC, 11.5MC, 13 MC, 15MC, by Stanley Ward. Final rept. on Contract DA 36-039-sc-81249. 30 Sep 60, 151p. AD-245 612.

DESCRIPTORS: Quartz crystals, *Crystal filters, Production, Manufacturing methods, *Discriminators, High frequency, Design, Test sets, Tests, Quality control.

A program is described providing U.S. Signal Corps with preproduction samples and pilot run quantities of quartz crystal filters and discriminators at 10, 11.5, 13 and 15 mc. The report includes the development program, the method of manufacture, and quality control data. The report, based upon the experience of manufacturing some 600 filters and discriminators, concludes that the units can be manufactures in large quantities. Manufacture in the quantities of 3260 filters and 3200 discriminators, the mobilization quantities, would require additional tooling and personnel. (Author)

PB 162 101 Available on loan from OTS

Institute of Optics, U. of Rochester, N. Y.
SCANNING METHOD TO DETERMINE SPOT SIZE. Progress rept. no. 2, July-Oct 52, on Contract AF 18(600)193. [1952] 15p. AD-7013.

DESCRIPTORS: *Photoelectric cells, Sensitivity, *Photoconductive films, Physical properties, *Lead compounds, *Sulfides.

Experiments have been continued to determine the effective spot diameter falling on the scanned photosensitive surface.

PB 162 219 $21.00

[ITT] Kellogg, Chicago, Ill.
DEVELOPMENT OF TRANSPORTABLE LIGHTWEIGHT ELECTRONIC LOWER ECHELON AUTOMATIC SWITCHBOARD AN/TTC-14, by F. S. Kasper, T. A. Pickering and others. Quarterly progress rept. no. 1, 28 May-31 Dec 58, on Contract DA 36-039-sc-77988. [1959] 395p. AD-214 030.

DESCRIPTORS: Electronic equipment, Automatic, Multichannel telephone systems, *Panel boards (Electricity), Circuits, Design.

The system and circuit considerations are presented for the development of an electronic, automatic switch board to be used with a 4-wire telephone system. Space-division switching of lines and trunks is used; time-division switching is used for the intra-switchboard functions. The switchboard is broken down into 9 major blocks: line circuits, trunk circuits, line links, trunk links, crosspoint matrix, allotters, scanner, tone generators, and power supply. Each of these blocks is discussed, and logic diagrams of each are presented. In-band tone signaling is employed in the four-wire telephone system. A discussion of an improved tone receiver/detector systems is presented. Magnetic glass reed relays are used for actual connection of called and calling lines. A system of all-electronic switching is shown. A description of each of the basic logic building blocks is given, with schematic diagrams of the variations of each of the logic circuits. A complete line link using magnetic logic elements is described. The switchboard is designed to operate in ambient temperatures of -40°F to 125°F, and the design of semiconductor circuits to operate reliably within this temperature range is explained. A report on the construction of the engineering test model of the switchboard is presented.

PB 162 154 $13.00

[ITT] Kellogg, Chicago, Ill.
DEVELOPMENT OF A TRANSPORTABLE LIGHTWEIGHT ELECTRONIC LOWER ECHELON AUTOMATIC SWITCHBOARD AN/TTC-14, by E. S. Bieszczad, R. E. Arseneau and others. Quarterly progress rept. no. 4, 1 July-30 Sep 59, on Contract DA 36-039-sc-77988. [1959] 184p. AD-231 921.

DESCRIPTORS: Automatic, *Multichannel telephone systems, *Circuits, *Switching circuits, Design, *Telephone communication systems, *Printed circuits, *Panel boards (Electricity) *Oscillators, *Power supplies, *Transistors, *Instruction manuals

Additional design modifications of the Lower Echelon Automatic Switchboard are presented. The design of the magnetically regulated power supply is described. The effects of lightning and measures to provide lightning protection are discussed. Component screening and the resultant gains in reliability, and justification for the use of Kellogg Switchboard and Supply Company specified transistors are discussed. A proposed format for writing instruction manuals and a parts list of electronic components used in the Service Test Model is presented. Mechanical design features are discussed with diagrams illustrating the manner in which the unit can be serviced. (Author) (See also AD-225 926)

NASA N62-10343 $3.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A SIMPLE BEAMSHAPING DEVICE FOR CASSEGRAINIAN ANTENNAS, by P. D. Potter. Rept. on Contract NAS7-100. Jan 62, 38p. 9 refs. Technical rept. no. 32-214; AD-273 503.

AD-273 049 repriced $1.25

Lockheed Aircraft Corp., Sunnyvale, Calif.
BASIC RESEARCH IN FUEL CELLS: AMMONIA, ETHYLENE GLYCOL, AND UREA SYSTEMS. Final rept. 1 July 60-31 Aug 61, on Contract DA 44-177-tc-634. Nov 61, 41p. 9 refs. TCREC TR-61-135.

DESCRIPTORS: *Fuel cells, *Wet Cells, *Electrolytic cells, Electrodes, *Anodes (Electrolytic cell), *Cathodes (Electrolytic cell), Catalysts, Platinum, *Fuels, *Ammonia, Ethylenes, *Glycols, *Urea, Electrolytes, Potassium compounds, Hydroxides, Carbonates

Research work was conducted on electrochemical fuel cells operating with $NH_3$, ethylene glycol, or urea fuel. This work was primarily with aqueous, low-temperature systems in $K_2CO_3$ or KOH electrolytes. The program included an electrode preparations and electrochemical evaluations study, the use of gas adsorption techniques and other methods in catalyst evaluation, and preliminary engineering and design studies on fuel cell batteries. Experiments showed that one of the basic systems studied, aqueous $NH_3$ and glycol anodes show definite promise, whereas the urea system did not. The acid glycol and the acid urea systems were not promising. Oxidation of the $NH_3$ to N and water was 100% complete. A typical $NH_3$ anode potential (2.2M $NH_3$, 30% KOH, 50 C, current density equals 1.0 ma/sq. cm) is 0.5 v. (Author)

PB 159 760-1 $11.00

Lockheed Aircraft Corp., Sunnyvale, Calif.
ELECTRONIC COUNTERMEASURES AND COUNTER COUNTERMEASURES. PART I. A SELECTIVE BIBLIOGRAPHY, 1959-1 JULY 1961, comp. by George R. Evans. Rept. on Contract NOrd-17017. July 61, 141p. 370 refs. Rept. 3-80-61-12, pt. 1; Special bibliography SB-61-43, pt. 1.

DESCRIPTORS: *Bibliography, *Countermeasures, Radar antijamming, Radio antijamming, Radar deception, Radio deception, Antennas, Polarization, Radar jamming, Radio jamming, Radar homing, Radar interception, Radar receivers, Radio receivers, Radar transmitters, Radio transmitters

The ASTIA Technical Abstract Bulletin has been the primary source of the references cited. Since a great majority of the reports are classfieid, very few abstracts have been included in the compilation. The report references are arranged individually by company within broad subject categories. A search was conducted in the open literature for the same period (1959-1 July 1961). Subjects included are countermeasures philosophy, concepts and techniques, jamming and antijamming techniques, deception systems and techniques, detection systems and techniques, ECM antennas, radar discrimination, radar tracking systems, radar homing countermeasures, polarization techniques and receiving and transmitting sets and systems. No effort was made to include material on IR countermeasures techniques; also excluded are references to chaff and confusion reflectors. (Author)

PB 159 760-2 $4.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
ELECTRONIC COUNTERMEASURES AND COUNTER COUNTERMEASURES. PART II. A REPORT BIBLIOGRAPHY, 1957-1958, comp. by George R. Evans. Rept. on Contract NOrd-17017. July 61, 48p. 115 refs. Rept. 3-80-61-12, pt. 2; Special bibliography SB-61-43, pt. 2.

DESCRIPTORS: *Bibliography, *Countermeasures, Radar antijamming, Radio antijamming, Radar deception, Radio deception, Distortion, Antennas, Radomes, Radar jamming, Radio jamming, Radar interception, Radar recievers, Radio recievers, Radar transmitters, Radio transmitters.

The sole source of the references cited herein has been the ASTIA TECHNICAL ABSTRACT BULLETIN. While indexes and abstracts were scanned, no open literature citations were considered important enough to be included. Since a great majority of the reports are classified, very few abstracts were available for inclusion. Indexes of open literature are presented below to preclude the possibility of a duplicate search. Subjects included are jamming and antijamming systems and techniques; countermeasures philosophy, concepts and techniques; deception and distortion techniques; anti-spoof techniques; detection techniques; ECM antennas and radomes; countermeasures receiving and transmitting sets and systems. No effort was made to include material on IR countermeasures; also excluded are references to chaff and confusion reflectors. (Author)

PB 159 649 $1.60

Lockheed [Aircraft Corp., Sunnyvale] Calif.
A NEW CLASS OF PASSIVE ELEMENTS FOR MICROSYSTEM CIRCUITS, by P. S. Castro and W. W. Happ. Aug 60, 15p. 8 refs. LMSD-703091.

DESCRIPTORS: *Miniature electronic equipment, Circuits, *Thin films, Analysis, Matrix algebra

The conception, fabrication and representative circuit applications of a unique and novel three-port, distributed-parameter, microsystem circuit element is reported. Constructed by deposition of alternate resistive and capacitive layers, this element has circuit characteristics which extends the presently known number of passive microsystem distributed-parameter components from five to thirty-four. With these components it becomes possible to realize circuit function unobtainable by synthesis of any finite number of conventional lumped, passive components. Specifically, a null-network, with a figure-of-merit in excess of the theoretical limit of a Wien-bridge or a Twin-T network, was realized by a single component. An impedance as well as an admittance formulation of the frequency response of this three-port was accomplished by extending the calculus of singu-

lar (indefinite) matrices. Asymptotic plots describing attenuation and phase characteristics were developed to serve specific, representative circuit applications, namely, lead and lag networks for one-ports; coupling, decoupling and frequency selective networks for two-ports. (Author)

PB 159 645 $1.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
PHOTOVOLTAIC SOLAR ENERGY CONVERTERS FOR SPACE VEHICLES: PRESENT CAPABILITIES AND OBJECTIVES, by W. W. Happ and A. B. Francis. May 60, 15p. 8 refs. LMSD-285180.

DESCRIPTORS: *Solar cells, Circuits, Properties, Temperature, Photosensitivity, Spectrographic data, Generators, *Photoelectric cells, Solar energy, Spaceships.

The objective of this paper is a critical analysis of experimental data of silicon solar cells under various operating conditions and environment; methods of overcoming present limitations of silicon solar cells, and preliminary results on potential new materials and device designs; and problems arising from the unique properties of the silicon solar cells as a circuit element.

PB 159 650 $4.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
TRANSIENTS IN MICROSYSTEMS, by F. A. Lindholm and W. W. Happ. [1960] 49p. 11 refs. LMSD-703107.

DESCRIPTORS: *Miniature electronic equipment, Circuits, Digital systems, *Thin films, Dielectric properties, Wave characteristics, Topology, Transformations (Mathematics)

To provide the designer of digital circuits with the potential of a recently developed class of microsystem structures, consisting of thin films of resistance plated on a dielectric substrate, the transient behavior of these components was investigated analytically and experimentally. A survey was made of alternative approaches for computing the transient response. For arbitrary termination and drive, two methods proved effective: one of mathematical significance due to Gray (1960), the other of practical use to the circuit designer pioneered by Linvill (1958). Following Linvill, a lumped model based on physical phenomena was developed and demonstrated to be optimum for circuit design. Experimental agreement with waveshape and response time was excellent. (Author)

NASA N62-15100 $1.60

Minneapolis-Honeywell Regulator Co., Minn.
ADAPTIVE CONTROLLERS DERIVED BY STABILITY CONSIDERATIONS, by E. R. Rang. Rept. on Contract NASr-27. 15 Mar 62, 13p. 6 refs.

PB 162 071 $6.60

Motorola, Inc., Chicago, Ill.
INVESTIGATION OF I. F. BANDPASS (FIX-TUNED) FILTERS FOR TRANSISTORS, by B. Niederman and J. Unick. Final rept. 15 May-15 Aug 57, on Contract DA 36(039) sc-71174. [1957] 62p. AD-158 131.

DESCRIPTORS: *Intermediate frequency filters, Design, *Band-pass filters, Transistors, Circuits, Subminiature electronic equipment, Alloys, Ferrites, Metals.

Investigation was completed for a subminiature, fixed tuned, bandpass IF filter for use with transistors operating at 455 kc. Various materials were tested as end plate alloys. Of these alloys only two were not totally objectionable with regard to frequency drift. They were Sylvaloy (Ni+3% Si) and the family of Ni-Fe alloys. Alloys exhibiting low Q were Nivac-P, A-Ni and some of the Ni-Fe alloys. The remainder of the alloys exhibited moderate and high Q values. Some alloys were rejected for low coupling coefficients; among these are Nivac-P, the sintered Ni alloys and radar. The initial phase of the SSB investigation pertained to LF's. Single-side-band filters with good temperature stabilities were developed. Their attenuation rise from 6 to 40 db occurred in 600 cps. The superiority of ferrites over metals as end plates at HF was clearly demonstrated; their inherent losses were extremely low. Vibrational effects of the center plates at these higher modes of vibration is very dependent upon form factor. The drive coil assembly should be carefully designed, and each pi winding must be less than $\lambda/2$ at the desired vibration frequency.

PB 162 103 $8.60

National Carbon Co., Cleveland, Ohio.
FABRICATION OF MAGNESIUM PRIMARY CELLS AND BATTERIES, by S. A. Martosko. Final rept. 4 Apr 57-15 Dec 59, on Contract DA 3o-039-sc-73250. [1959] 96p. AD-232 221.

DESCRIPTORS: *Battery compartments, *Battery separators, Magnesium, Magnesium compounds, Dry cells, *Primary batteries, Paper.

Fabrication of paper lined magnesium cells and battery packs did not meet the expected capacity standards. Probable cause of failure was marginal magnesium can quality and contaminants in the magnesium bromide electrolyte. (Author)

UCRL-13044 $11.00

Packard Electric Div., General Motors Corp., Warren, Ohio.
DETERMINATION OF OPTIMUM MATERIALS FOR FLAT CABLE MANUFACTURE, by Alfred E. Mason. Rept. on Contract W-7405-eng-48. [1961] 142p. 40 refs.

PB 162 229 $8.60

Raytheon Co., Bedford, Mass.
IMPROVEMENT OF MAGNETOSTRICTION-ROD FILTERS. Final engineering rept. on Contract AF 30(635)2902. Apr 57, 99p. Rept. no. BR-171; RADC-TR-57-120; AD-131 172.

DESCRIPTORS: *Radiofrequency filters, Magnetostrictive resonators, Metallurgy, *Nickel alloys, Deformation, Heat treatment, Electrical properties, Band-pass filters

The engineering services, experimental filter models, and test equipment are described which are necessary for the improvement of magnetostriction rod-filters of low bandwidth, high dynamic range, and good stability. A prototype 2-c filter panel was fabricated, tested, and is undergoing evaluation. The improvement of existing filter designs and the development of very narrow bandwidth filters required that a large part of the investigation be devoted to the properties of Ni-Span C. This material was established as the best available filter-rod material. Composition, plastic deformation, heat-treatment conditions, and magnetic parameters were studied for their effect on Ni-Span C. Experiments were also performed to determine the dependence of filter electrical characteristics on drive and pickup transducers, external shields, and the mechanical configuration. A variety of other constant-modulus alloys were previously developed, but Ni-Span C is the first to take advantage of precipitation hardening to obtain improved elastic and mechanical properties in combination with a temperature coefficient of modulus easily adjusted around zero by a simple heat treatment. Ni-Span C was also shown to possess useful magnetic properties. The material is moderately permeable up to its Curie point of 200°C and may be excited magnetostrictively over its useful constant-modulus temperature range. The electromechanical coupling coefficient is somewhat lower than that for Ni. (See also PB 138 886)

DP-731 $0.50

Savannah River Lab., Aiken, S. C.
A POWER SUPPLY FOR AN ELECTRON BEAM WELDER, by H. S. Sanders. Rept. on Contract AT(07-2)-1. June 62, 10p.

PB 162 222 $2.60

Stanford Electronics Labs., Stanford U., Calif.
TIN OXIDE ATTENUATOR FILMS FOR TRAVELING-WAVE TUBES, by W. H. Kohl. Rept. on Contract DA 36-039-sc-63189. 25 June 56, 22p. 16 refs. Technical rept. no. 453-1; AD-97 696.

DESCRIPTORS: *Traveling wave tubes, Electronic equipment, *Radiofrequency attenuators, Materials, Oxides, *Tin compounds, Films.

$SnO_2$-coated glass rods for the support of a helix in an X-band TWT were studied. $SnO_2$ films are applied to the glass substrate by the thermal decomposition of a halide vapor, such as $SnCl_4$, which is hydralized when it comes into contact with the hot glass surface. The following reaction occurs: $MCl_4 + 2H_2 + 2CO_2 \rightarrow MO_2 + 4HCl + 2CO$ if $CO_2$ is used as the carrier gas, or an organic alcohol, such as ethyl alcohol or glacial AcOH, or a mixture of the 2, is added to the salt solution. The basic reaction may be written as $SnCl_4 + 2H_2O \rightarrow SnO_2 + 4HCl$. The $SnO_2$ films produced are transparent and adhere to the glass. The films cannot be removed by any acid and withstand abrasion and exposure to elevated temperatures of the order of 600°C. Film thicknesses range from 1000 to 4000 A and are irridescent in incident white light. Measurements show the superiority of $SnO_2$ films over graphite films as far as operation in air at elevated temperature is concerned. Comparative loss characteristics are given for Aquadag stripes painted directly on the barrel of a TWT and a glass sleeve coated with $SnO_2$ on the inside at 600°C; the $SnO_2$ gave higher loss over most of the frequency band. Procedures are described which extend known techniques for the application of $SnO_2$ films on glass substrates by hydrolysis of a halide vapor at the hot glass surface.

PB 162 232 $5.60

Stanford Research Inst., Menlo Park, Calif.
STRIP TRANSMISSION LINES AND COMPONENTS, by P. M. Sherk, J. K. Shimizu and others. Quarterly progress rept. no. 7, 1 May-31 July 56, on Contract DA 36-039-sc-63232. Sep 56, 53p. 8 refs. SRI Proj. 1114; AD-127 499.

DESCRIPTORS: *Transmission lines, Microwave equipment, Couplings, Cavity resonators, Circuits.

An analysis is made of a three-section coupled-strip-line directional coupler. The length of each section is one quarter-wavelength at midband, resulting in a total length of three quarter-wavelengths. By proper design of the sections, perfect match and directivity may be obtained at all frequencies, and the coupling may be held almost constant over a very wide bandwidth. Two theorems are derived for flat-plate resonators of arbitrary shape located centrally between parallel ground planes. Such resonators are expected to prove useful in strip-line filter circuits, reference cavities, and any other devices requiring sharply tuned resonant elements. One theorem relates to a method of altering the dimensions of the resonator in order to eliminate the effect of the fringing field on resonant frequency. The other theorem relates to the stored energy of a resonator with and without the existence of a fringing field. (Author)

PB 162 075-1 $4.60

Stevens Inst. of Tech., Hoboken, N. J.
A HIGH EFFICIENCY CAPACITOR BANK STUDY, by K. C. Rogers, D. Finkelstein and others. Quarterly progress rept. no. 1, 30 June-30 Sep 58, on Investigation of Plasma Acceleration, Contract DA 36-039-sc-78097. [1958] 44p. 13 refs. AD-207 851.

DESCRIPTORS: *Capacitors, Voltage, *Electronic circuits, Inductance, Switching circuits, Transmission lines, Frequency, Measurement, Design.

The design of a 100,000-j low inductance capacitor bank is given in detail. The system of capacitors,

transmission lines, switches, and load is analyzed, and the results for the complete bank are presented. The bank utilizes a 14F680 General Electric 1-mf, 50-kv low inductance capacitor and vacuum-gap low inductance switches. The switches are capable of switching 100,000 A currents and of standing off 50 kv voltages. Ringing frequency measurements have been made on a section of the bank. The measurements agree well with the results of the circuit analysis. The short circuit electrical parameters of the 100,000 j bank are $I_{mx} = 3.5 \times 10^6$ A., $\left(\frac{di}{dt}\right)_{t=0} = 1.3 \times 10^{13}$ A $sec^{-1}$, quarter period $\frac{T}{4} = 0.53 \times 10^{-6}$ sec. The modifications necessary to increase the energy storage to 1,000,000 j are outlined and a design for a 1,000,000 j bank is presented. The million-joule bank discharging into a $10^{-9}$ h inductive load will have $I_{mx} = 32 \times 10^6$ A, $\left(\frac{di}{dt}\right)_{t=0} = 50 \times 10^{12}$ A $sec^{-1}$, $\frac{T}{4} = 5.0 \times 10^{-6}$ sec. (Author)

PB 162 231 $5.60

Transitron Electronic Corp., Wakefield, Mass.
HIGH EFFICIENCY SILICON SOLAR CELLS, by Pierre Lamond, Alexander J. Oszy, and Frederick P. Smith. Semiannual technical summary rept. no. 2, 1 Jan-30 June 60, on Contract DA 36-039-sc-85250. [1960] 51p. 1 ref.
ARPA Order no. 80-59; AD-245 591.

DESCRIPTORS: *Solar energy, *Photoelectric cells, Photoelectric materials, Photons, Photosensitivity, Silicon, Effectiveness, *Reflection, Coatings, *Power supplies.

Additional work on an antireflection coating is given. An analysis of the spectral response curves of solar cells with respect to the N and P regions are presented. A method of determining the lifetime of the minority carriers in the parent material from the spectral response curves is presented. The spectral response curves of the N and P layers are analyzed to determine the direction in which future work should go in order to obtain the greatest inherent improvement in solar cells. Preliminary work on both P on N and N on P cells to determine the extent of electron radiation damage is covered. (Author)

## Ordnance, Missiles, and Satellite Vehicles

PB 162 106 $6.60

Applied Mathematics and Statistics Lab., Stanford U. Calif.
A COMPARISON OF MILITARY STANDARD 105A WITH THE 1944 ARMY SERVICE FORCES SAMPLING PROCEDURES AND TABLES AND WITH JAN-STANDARD 105, by Seymour J. Lorber and Eugene L. Grant. Technical rept. no. 2 on Contract N6onr-25126. 1 Apr 51, 70p. ATI-122 854.

DESCRIPTORS: *Sampling, *Military requirements, Standards, *Quality control, Probability, Tables.

This report assumes that the reader has a general familiarity with the principles and terminology involved in acceptance sampling by attributes. It particularly assumes that he understands the meaning of an OC (operating characteristic) curve of a sampling plan. It also assumes that he is familiar with single, double, and multiple (sequential) sampling.

NASA N62-15580 $8.10

Astrophysical Observatory, Smithsonian Institution, Cambridge, Mass.
CATALOGUE OF SATELLITE OBSERVATIONS NO. C-29, by Beatrice Miller. Rept. on Grant NsG-87-60. 25 June 62, 86p. SAO Special rept. no. 97.

NASA N62-15579 $7.60

Astrophysical Observatory, Smithsonian Institution, Cambridge, Mass.
CATALOGUE OF SATELLITE OBSERVATIONS NO. C-30, by Beatrice Miller. Rept. on Grant NsG-87-60. 25 June 62, 72p. SAO Special rept. no. 98.

NASA N62-15207 $2.60

Committee on Space Research (COSPAR), The Hague (Netherlands).
EXPLORER X PLASMA MEASUREMENTS, by A. Bonetti, H. S. Bridge and others. [1962] 22p. 9 refs.

Presented at Third International Space Science Symposium and Fifth COSPAR Plenary Meeting, Washington, 30 Apr-9 May 62.

NASA N62-15221 $2.60

Committee on Space Research (COSPAR), The Hague (Netherlands).
PLASMA PROBE INSTRUMENTATION ON EXPLORER X, by Herbert S. Bridge, Alan J. Lazarus and others. [1962] 21p. 4 refs.

Presented at Third International Space Science Symposium and Fifth COSPAR Plenary Meeting, Washington, 30 Apr-9 May 62.

PB 162 195 $3.60

Electronic Defense Labs., Mountain View, Calif.
PREDICTION OF EARTH SATELLITE PASSES, by Harold Chatland. Rept. on Contract DA 36-039-sc-78281. 19 Feb 60, 38p. 5 refs. Technical memo. no. EDL-M230; AD-235 899.

DESCRIPTORS: *Satellite vehicle trajectories, *Orbital flight paths, Mathematical analysis, Position finding, Visibility.

Two methods by which the passage of an earth satellite

may be predicted are given in detail and are compared as their simplicity, accuracy, and utility. It is shown that the time and approximate position of the satellite on a favorable passage may be determined easily without lengthy computations. The likelihood that a satellite will be visible to the unaided eye is discussed briefly. (Author)

NASA N62-15171 $1.10

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
VENUS RADAR SYSTEMS INVESTIGATIONS, by J. F. Reintjes. Semiannual status rept. 1 Sep 61-1 Apr 62, on Grant NsG-234-61. 11 Apr 62, 6p. 2refs.

NASA N62-15558 $6.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ELECTRICALLY PROPELLED SPACECRAFT AND ASSOCIATED SUBJECTS, comp. by Judith Hayes. Rept. on Contract NAS7-100. May 62, 66p. 314 refs. Astronautics Information Literature Search no. 428; NP-11967

NASA N62-15312 $7.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SPACE PROGRAMS SUMMARY NO. 37-16, VOLUME III, 1 MAY-1 JULY 62. DEEP SPACE INSTRUMENTATION FACILITY. Rept. on Contract NAS7-100. 31 July 62, 80p. 9 refs. JPL-SPS-37-16, Vol. III.

NASA N62-14924 $2.75

Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
A REPORT ON THE RESEARCH AND TECHNOLOGICAL PROBLEMS OF MANNED ROTATING SPACECRAFT. Aug 62, 146p. 19 refs. NASA TN D-1504.

NASA N62-15248 $1.00

Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
A SIMPLE SOLAR ORIENTATION CONTROL SYSTEM FOR SPACE VEHICLES, by Seymour Salmirs, S. Lawrence Kessler, and Otis J. Parker. Sep 62, 36p. 3 refs. Technical note D-1271.

NASA N62-15177 $0.75

Marshall Space Flight Center, National Aeronautics and Space Administration, Huntsville, Ala.
SATURN VEHICLE ATTITUDE RESOLVER COMPUTER ERROR ANALYSIS, by Herman E. Thomason. Sep 62, 29p. 1 ref. Technical note D-1119.

PB 162 098 $8.60

Missile Div., Chrysler Corp. [Detroit, Mich.]
DEVELOPMENT OF AN ORIENTED-WEDGE BEARING, by D. O. Bard. Interim technical documentary rept. on Contract AF 33(616)6614. May 60, 92p. 3 refs. Rept. no. RL-R1; AD-247 655.

DESCRIPTORS: *Gas bearings, Design, Tests, Wedges, *Gyroscopes.

The objective is to develop an oriented-wedge, air-lubricated bearing for potential application to a gyroscope, which is self-centering, that requires no preloading, and has almost unlimited life. In addition, the bearing should be capable of sustained operation at speeds in excess of 20,000 revolutions per minute (rpm), withstand up to a 10g radial and thrust load while in operation and 20g in a nonoperating mode, with a rotor weight of not more than 2 pounds. The 2-wedge, 60-degree tapered-end plate bearing performed satisfactorily under a 13.3g radial load, 3.2g thrust load, at 24,000 rpm. Extrapolation of test data indicates that maximum load capability is 40 pounds radially (20g). The 2-wedge housing, 60-degree tapered-end plate bearing configuration performed better than any other bearing configuration when an unbalanced rotor was used. The 2-wedge, 60-degree tapered-end plate bearing experienced no metal-to-metal contact throughout a 180-degree position rotation at 24,000 rpm. The 3-wedge housing, 3-wedge end plate bearing performed satisfactorily under a 27-pound radial load (14g), which can be extrapolated to a 29-pound maximum load for this bearing; the applied thrust load was 5.3 pounds or 2.7g. (Author)

NASA N62-10068 $5.60

Southwest Research Inst., San Antonio, Tex.
A STUDY OF TRACE CONTAMINANTS IN ENCLOSED SYSTEMS, by Herbert C. McKee, H. P. Burchfield, and John W. Rhoades. Final technical rept. on Contract NASw-150. Jan 62, 56p. 8 refs.

## Sanitation and Safety Engineering

NAA-SR-MEMO-7212 $1.60

Atomics International, Canoga Park, Calif.
FUEL HANDLING MACHINE SHIELDING REQUIREMENTS FOR SRE CORE III, by W. A. Schumann. 7 Mar 62, 20p. 3 refs.

## FOOD, HANDLING, AND PACKAGING EQUIPMENT

CEX-59.4.11 $1.00

Geological Survey, Washington, D. C.
AERORADIOACTIVITY SURVEY AND AREAL GEOLOGY OF THE HANFORD PLANT AREA, WASHINGTON AND OREGON (ARMS-I), by Robert G. Schmidt. March 61, 25p. 21 refs. Prepared in cooperation with the Atomic Energy Commission. Div. of Biology and Medicine.

HW-73366 $0.75

Hanford Atomic Products Operation, Richland, Wash.
EVALUATION OF RADIOLOGICAL CONDITIONS IN THE VICINITY OF HANFORD JANUARY-MARCH, 1962, ed. by I. C. Nelson. Rept. on Contract AT(45-1)-1350. 23 Apr 62, 23p. 2 refs.

HW-72321 $1.25

Hanford Atomic Products Operation, Richland, Wash.
FISSION PRODUCT RELEASE FROM URANIUM. EFFECT OF IRRADIATION LEVEL, by R. K. Hilliard and D. L. Reid. Rept. on Contract AT(45-1)-1350. 20 June 62, 47p. 22 refs.

IDO-12020 $1.00

Idaho Operations Office, Atomic Energy Commission, Idaho Falls.
RESPIRATORY PROTECTION PROGRAM FOR THE NATIONAL REACTOR TESTING STATION, by Bruce J. Held and Loren J. Hueter. 3 May 62, 40p. 4 refs.

TID-15916 $8.10

Reynolds Electrical and Engineering Co., Inc., Mercury, Nev.
ANALYTICAL PROCEDURES OF THE RADIOLOGICAL SAFETY LABORATORY, NEVADA TEST SITE, comp. by E. L. Geiger and E. L. Whittaker. Rept. on Contract AT(29-2)-162. Apr 61, 86p.

IDO-19310 $4.60

Weather Bureau, Idaho Falls.
THE ROLE OF METEOROLOGY FOLLOWING THE NUCLEAR ACCIDENT IN SOUTHEAST IDAHO, by Norman F. Islitzer. May 62, 43p. 5 refs.

PB 162 110 $9.60

Oregon State [U.] Agricultural Experiment Station, Corvallis.
INCREASING THE ACCEPTANCE OF IRRADIATED MEAT AND MEAT PRODUCTS BY SELECTED TREATMENTS BEFORE, DURING AND FOLLOWING IRRADIATION, by H. W. Schultz, R. F. Cain and others. Rept. no. 16 (Final), 28 Dec 56-1 Sep 60, on Contract DA 19-129-qm-836. [1956] 119p. 9 refs. File no. S-503; AD-253 643.

DESCRIPTORS: *Meat, *Food, *Radiation effects, Acceptability, Processing, *Beef, Storage, Preservation, *Pork, Heating, Test methods, Salts.

Experimental data indicated that beef, steaks and roasts, or ground beef should be treated with salt containing charcoal and condensed wood smoke, heated to a minimum of 160 F., internal temperature, packed in nitrogen gas and then irradiated at dosages up to 4.8 megarad. Beef so treated, will possess a flavor that, though different from non-irradiated beef is acceptable. Pork chops and roasts, should be heated to a minimum of 170 F., internal temperature, nitrogen packed and irradiated. The flavor of this product will be found to be acceptable even if irradiated to 4.8 megarad. Flavor preference panels evaluating beef and pork cuts, treated in the above manner, found these products to retain their acceptability during storage for at least 8 months at 72 F. (Author)

## MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

TID-15295 $6.60

Mechanical Technology, Inc., Latham, N. Y.
THE HYBRID GAS LUBRICATED JOURNAL BEARING, by J. W. Lund. 15 Mar 62, 64p. 3 refs. MTI-62TR2.

### Engines and Propulsion Systems

NASA N62-15406 $5.60

Aerojet-General Corp., Sacramento, Calif.
ALGOL SOLID ROCKET MOTOR PROGRAM. Monthly progress rept. no. 11 for Apr 62 on Contract NAS1-1330. 31 May 62, 52p. Rept. 0498-01M-11.

NASA N62-15407 $4.60

Aerojet-General Corp., Sacramento, Calif.
ALGOL SOLID ROCKET MOTOR PROGRAM. Monthly progress rept. no. 12 for May 62 on Contract NAS1-1330. 30 June 62, 46p. Rept. 0498-01M-12.

NASA N62-15408 $1.60

Aerojet-General Corp., Sacramento, Calif.
ALGOL SOLID ROCKET MOTOR PROGRAM. Monthly progress rept. no. 13 for June 62 on Contract NAS1-1330. 15 July 62, 15p. Rept. 0498-01M-13.

NAA-SR-7085 $3.60

Atomics International, Canoga Park, Calif.
ELECTRIC PROPULSION APPLICATIONS FOR SNAP SYSTEMS, by C. J. Morse. Rept. on Contract AT(11-1)-GEN-8. 6 Apr 62, 40p. 12 refs.

NASA N62-10215 $1.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DEVELOPMENT OF A TRAJECTORY-CORRECTION PROPULSION SYSTEM FOR SPACECRAFT, by W. W. Smith. Rept. on Contract NASw-6. 8 Dec 61, 16p. Technical rept. no. 32-205.

NASA N62-10349 $2.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EXPERIMENTS ON THE INTERACTION OF SECONDARY INJECTANTS AND ROCKET EXHAUST FOR THRUST VECTOR CONTROL, by J. F. Newton, Jr. and F. W. Spaid. Rept. on Contract NAS7-100. 12 Feb 62, 29p. 3 refs. Technical rept. no. 32-203.

### Manufacturing Equipment and Processes

PB 162 077 $1.10

[Numerical Analysis Research] U. of California, Los Angeles.
WHO THREW THE MONKEY-WRENCH IN MR. TIPPETT'S THEORY, by G. Eric McAllister and Ross Nelson. Rept. on Contract Nonr-23302. 30 Jan 53, 9p. Management Sciences Research Project Research rept. no. 3; AD-144 495.

DESCRIPTORS: *Industrial production, *Quality control, Sampling, Errors.

PB 162 076 $1.60

[Numerical Analysis Research] U. of Calif., Los Angeles.
THE WORK SAMPLING TECHNIQUE, by A. J. Rowe. Rept. on Contract Nonr-23302. 23 Feb 53, 15p. [Management Sciences Research Project] Research rept. no. 11; AD-144 494.

DESCRIPTORS: *Quality control, *Industrial production, Sampling

SCR-497 $1.60

Sandia Corp., Albuquerque, N. Mex.
EVALUATING A QUALITY CONTROL PROGRAM, by A. F. Cone. Apr 62, 16p.

## MATERIALS

PB 162 230 $1.60

Borden Co. [Philadelphia, Pa.]
A STUDY LEADING TO THE DEVELOPMENT OF A SOLVENTLESS LIQUID ADHESIVE WHICH POLYMERIZES BY CATALYTIC ACTION OF SURFACES TO BE BONDED, by Jack Dickstein, Rose-Marie Hoegerle, and Lawrence Verbit. Quarterly progress rept. no. 1, 28 May-10 Sep 59, on Contract DA 36-034-ORD-2928. [1959] 15p. AD-227 110.

DESCRIPTORS: *Acrylic resins, *Adhesives, Polymerization, Catalysis, Surfaces, Chelate compounds, Esters, Aluminum alloys, Steel

An adhesive system is being developed to meet the following requirements: (1) should be a solventless liquid at room temperature; (2) should curie at temperatures not to exceed 110°F; (3) should cure after the faying surfaces have been contacted; (4) should exhibit good storage life and rapid adhesive cure; (5) should possess good tensile or shear strength at -65°, 73°, and 160°F; (6) should, as a cured adhesive, possess good tensile or shear strength at room temperature, after a 1-wk storage at 160°F, and after 1-wk storage at 100°F and 35% RH; and (7) should bond to a wide variety of surfaces. Preliminary studies were begun with the analysis of methyl aplha-cyanoacrylate. The synthesis of other alpha-substituted acrylate esters and several liquid monomers containing chelating groups is being attempted.

PB 162 099 $1.10

[Detroit Arsenal, Center Line, Mich.]
DEVELOP PROCESS FOR APPLYING 0.010 TO 0.020-INCH THICK PROTECTIVE COATINGS TO TORSION BARS. EVALUATE THE PROTECTIVE COATING APPLIED TO THE BEST PROCESSES FOR EACH TYPE OF COATING, by James K. Matter and Fred W. Smith. Memo. rubber process rept. 25 May 52, declassified. 9p. Rept. no. 2464; AD-11 721.

DESCRIPTORS: *Torsion bars, Aluminum, Steel, *Coatings, Adhesives, Test methods, Tests.

The following coatings were used with a mixture of cyclohexanone and MeCOEt as a thinner: XAS-110 and XAS-120 Buna-N adhesives, XO-102 air-drying Organosol and XO-101 Organosol. Coatings were applied by dipping, by a siphon-type air gun, and by a pressure-type air gun. Coatings of various dilution ranges were sprayed or dipped on aluminum and steel panels. Finished panels were given a 10,000-v corona-spark test, and the impact scuff of each coat was determined. Two dip coats of XAS-120, which had a no. 2 Zahn viscosity of 120 sec, furnished a final coat of 0.010 in. in thickness. Such a specimen, which was baked 4 hr at 150°F, developed the best electrical resistance.

PB 162 193 $8.10

Houze Glass Corp., Point Marion, Pa.
DEVELOPMENT OF HIGH STRENGTH VITREOUS FIBERS AND STUDIES LEADING TO MAXIMUM TRANSLATION OF FIBER PROPERTIES TO REINFORCED PLASTIC LAMINATES, by J. D. Provance. Final technical rept. 1 July 59-31 Oct 60, on Contract NOas-59-6258-c. 31 Oct 60, 88p. 1 ref. AD-252 190.

DESCRIPTORS: *Glass textiles, *Laminates, *Plastics, *Ceramic fibers, Epoxy resins, Fibers, Phenolic resins, Glass, Production, Reinforcing materials, Mechanical properties, Tensile properties, Manufacturing methods, Tests.

A new glass composition has been developed which, when drawn into glass fibers and combined with conventional resins, produces a reinforced plastic laminate of unusual properties. The research and development program conducted to develop this glass composition was divided as follows: (1) Development of glass compositions from which continuous glass fibers with high tensile strength, high modulus, and high temperature resistance can be drawn. (2) Development of experimental furnace to permit fiberizing the glass composition. (3) Application of a maximum percentage of the high strength fiber properties to plastic structures. The glass fiber, identified as Houze 29-A glass fiber, has a specific gravity of 2.70, a high tensile strength and a high modulus of elasticity, and will offer designers a material with greatly improved strength to weight ratio. (Author)

AD-256 721 $6.60

Hughes Aircraft Co., Culver City, Calif.
DEVELOPMENT OF ULTRA HIGH TEMPERATURE DIELECTRIC MATERIALS FOR EMBEDDING ELECTRONIC PARTS, by John B. Rust and Charles L. Segal. Final rept. 10 Feb 59-10 Feb 60, on Contract NObs-77054. 1 Mar 60, 67p. 33 refs. Rept. no. TM-658.

DESCRIPTORS: *Embedding substances, Dielectrics, *Silicones, *Silicone resins, Resins, Thermosetting resins, Silanes, Benzenes, Polymers, Polymerization, Heat resistant polymers, Tin compounds, Metal-organic compounds, Silicon compounds, Dielectric properties, Electrical properties, Mechanical properties, Deterioration, Electronic equipment, Aging, Synthesis, Vinyl radicals.

The studies described in this report have been carried forward in three phases (a) prepolymers and crosslinking agents were prepared from the appropriate raw materials or intermediates; (b) the prepolymers and crosslinking agents were combined to produce insoluble-infusible resins; and (c) the resulting thermoset polymers were evaluated to determine their ability to meet the requirements of the contract.

PB 162 192 $4.60

Industrial Test Lab., Philadelphia Naval Shipyard, Pa.
SEA WATER LAUNDRY COMPOUNDS, by R. Bernstein and H. Sosson. Final rept. Oct 54, 41p. 25 refs. Specification Development rept. nos. 2355 and 2355A-F; AD-43 397.

DESCRIPTORS: *Detergents, Test methods, *Sea water, Solvent action, Specifications

Interim Federal Spec P-S-610 was revised to obtain better sea water laundry compounds. A new specification was proposed as a replacement which will permit procurement of more efficient sea water laundry compounds. A laboratory-scale, multicycle, alternate soilwash test is described which appears to be a reliable method for determining the efficiency of laundry compounds. The test gave detergent ratings which correlate very well with performance ratings on practical loads laundered in sea water and gave good discrimination between detergents. Detergent C, which is superior to the present specification compound (Igepon T), conformed to the requirements of the proposed specification.

UCRL-10119 $2.75

Lawrence Radiation Lab., U. of California, Berkeley.
INORGANIC MATERIALS RESEARCH DIVISION. Annual rept. 1961, on Contract W-7405-eng-48. 12 Mar 62, 197p. 92 refs.

NASA N62-15352 $22.25

Lockheed Nuclear Products, Marietta, Ga.
EFFECT OF NUCLEAR RADIATION ON MATERIALS AT CRYOGENIC TEMPERATURES, by W. L. Bridges and others. Quarterly progress rept. no. 1, Dec 59-Sep 60, on Contract NASw-114. [1960] 408p. 319 refs. NR-115.

NASA N62-15498 $8.60

Lockheed Nuclear Products, Marietta, Ga.
EFFECT OF NUCLEAR RADIATION ON MATERIALS AT CRYOGENIC TEMPERATURES, by W. L. Bridges and others. Quarterly progress rept. no. 2, Oct-Dec 60, on Contract NASw-114. [1962] 93p. NR-118.

NASA N62-15710 $9.10

Lockheed Nuclear Products, Marietta, Ga.
EFFECT OF NUCLEAR RADIATION ON MATERIALS AT CRYOGENIC TEMPERATURES, by A. W. Liebschutz. Quarterly progress rept. no. 3, Jan-Mar 61, on Contract NASw-114. [1961] 103p. NR-122.

PB 162 068 $1.60

Material Lab., New York Naval Shipyard, Brooklyn.
THE EFFECT OF BORIC ACID ESTERS ON THE PHYSICAL PROPERTIES OF SILICONE VULCANIZATES, by I. N. Cooperman. Final rept. 17 Dec 59, 17p. Proj. no. 5400-8; AD-230 097.

DESCRIPTORS: *Vulcanizates, *Silicones, Borates, Physical properties, Alkyl radicals, Elastomers, Esters, Boric acids.

Trimethyl and tri-n-butyl borate esters were added to representative dimethyl, methyl-phenyl, methyl-vinyl, and methyl-phenyl-vinyl silicone compounds to determine the effect of the esters on the physical properties of the respective compounded stocks. At levels of 2 parts or less of ester to 100 parts of silicone polymer the trimethyl borate ester had a slight beneficial effect on the tensile strength of the dimethyl and methyl-vinyl silicone stocks, no significant effect on methyl-phenyl-vinyl stocks, and a deleterious effect (at all levels) on the methyl-phenyl silicone stocks. In another test the trimethyl borate ester was adsorbed on Linde molecular sieves and added in this form to the methyl-phenyl-vinyl silicone compound. The resulting stocks exhibited generally poorer physical properties than comparable stocks formulated without the use of the molecular sieves. The tri-n-butyl borate ester had a slightly beneficial effect on the tensile properties of the methyl-vinyl silicone stocks and was effective in reducing the hot compression set of the material. However, this ester had either a detrimental effect or, in some cases, no appreciable effect on the physical properties of stocks of the remaining three silicone compounds. Addition of either ester to the silicone compounds at a level of 4 phr had a generally deleterious effect on the physical properties of the respective materials. (Author)

NCSC-2477-6 $2.25

North Carolina State Coll. School of Textiles, Raleigh.
MODIFICATION OF TEXTILE FIBER PROPERTIES BY GAMMA RADIATION, by Arthur A. Armstrong, Jr. and Henry A. Rutherford. Annual rept. 1 Nov 60-31 Oct 61, on Contract AT(40-1)-2477. 1 Jan 62, 103p.

SCTM-16-62(11) $1.60

Sandia Corp., Albuquerque, N. Mex.
PHOTOGRAPHIC EMULSION CALIBRATION, by M. M. Robertson and H. G. Palmer. Feb 62, 18p. 13 refs.

## Ceramics and Refractories

ORO-582 $4.60

Carborundum Co., Niagara Falls, N. Y.
SYNTHESIS AND FABRICATION OF REFRACTORY URANIUM COMPOUNDS, by K. M. Taylor and C. H. McMurtry. Summary rept. 1 Jan 61-15 Mar 62, on Contract AT(40-1)-2558. May 62, 48p. 1 ref.

GEMP-13A $1.50

General Electric Co., Cincinnati, Ohio
HIGH TEMPERATURE MATERIALS PROGRAM. Progress rept. no. 13, Part A, on Contract AT(40-1)-2847. 13 July 62, 66p. 12 refs.

PB 162 194 $4.60

IRCO Corp., New York.
A SYSTEM FOR APPLYING CERAMIC COATINGS BY MEANS OF ION BEAM HEAT SOURCES. Final rept. on Contract NObs-72418. 26 Oct 59, 44p. AD-228 659.

DESCRIPTORS: *Ceramic coatings, Enamel coatings, *Metal plates, Steel, Plasma physics, *Ion beams, Generators, Circuits.

An ion beam generator was developed for the localized deposition and repair of porcelain enamel coatings on steel plate. The temperature of the basic metal is slightly above the minimum required for effecting a bond with the coating. The design criteria that were used in the development of the breadboard system are described. Typical operation of the ion beam generator involves the flow of gas through a nozzle which has an electric arc drawn from an electrode to the nozzle. The gas flow rate is adjusted until the flame appears (through a medium density welder's glass) very much like a bunsen burner flame. This flame constitutes a conventional plasma jet. A second power supply is then turned on and generates the ion beam by electrically exciting the plasma jet between the electrode, nozzle, and work. The repair material in the form of a glass rod is melted by the ion beam and flowed into place on the steel specimen. It was demonstrated that the ion beam technique is applicable in the flat and

horizontal positions, to the deposition and repair of porcelain enamel coatings which conform to MIL-P-16961B.

PB 162 073 $8.60

Linden Labs., Inc., State College, Pa.
STUDY OF THE DEGRADATION OF HIGH K CERAMIC DIELECTRICS, by W. R. Buessem, P. A. Marshall, Jr., and W. A. Weyl. Final rept. on Contract DA 36-039-sc-71190, continuation of Contract DA 36-039-sc-42679. 30 Apr 58, 93p. AD-204 687.

DESCRIPTORS: *Ceramic materials, *Dielectrics, Deterioration, *Ceramic capacitors, Materials, Barium compounds, Titanates.

This report contains new experiments on $BaTiO_3$ dielectrics, stabilized by either $UO_3$ additions or fluorine treatment. The bodies with the highest addition (.516 mole %) and those without any addition obey the Curie-Weiss law, whereas the other bodies with intermediate $UO_3$ additions do not. It is postulated that the deviations from the Curie-Weiss law for the bodies with intermediate $UO_3$ additions are due to Maxwell-Wagner effects and that the break between the .258 and .516 mole % addition is due to the exsolution of a second phase, possibly of a non-ferroelectric nature. The Curie-Weiss straight line is shifted 14° to lower temperatures. This shift of the Curie-Weiss line to lower temperatures has been observed for some of the excellent bodies, stabilized with fluorine treatment. It is therefore possible that the high stability of fluorine treated materials is not only due to the reduction of anion vacancies but also to a second phase which acts as a barrier between the $BaTiO_3$ grains. Some arguments are presented which point to $BaTiF_6$ as the second phase. Experiments on fluorine treatment of commercial dielectrics indicate that fluorine has an effect on these more complex bodies similar to that which it has on straight $BaTiO_3$ bodies. There is not much difference between bodies which have been treated during the original firing and those which have been after-treated at temperatures close to the original. (Author)

PB 162 217 $11.50

New Jersey Ceramic Research Station, Rutgers, U., New Brunswick.
IMPROVED CERAMICS. Progress rept. no. 10, 1 Mar-1 June 57, on Contract DA 36-039-sc-64566. [1957] 152p. AD-158 020.

DESCRIPTORS: *Ceramic materials, Thermal stresses, Impact shock, *Insulating materials, Molding materials, Machining, *Radio equipment.

Contents:
High thermal shock ceramics
Ultra low loss ceramics
High impact resistant ceramics
Precision molded and machined radio ceramics
Physical structure of ceramic insulation

PB 162 104 $1.10

Pennsylvania State [U. Coll.] of Mineral Industries [University Park].
THE INFLUENCE OF THE ENVIRONMENT ON THE PROBABILITY OF ELECTRON TRANSFER, by M. D. Karkhanavala. Technical rept. no. 49, on Contract N6onr-269, T.O. 8. Apr 52, 9p. 6 refs. ATI-159 370.

DESCRIPTORS: *Glass, *Ion exchange, *Electrons, Transport properties, Polarization, Probability.

## Fuels, Lubricants, and Hydraulic Fluids

PB 162 215 $8.60

Armour Research Foundation, Chicago, Ill.
STABILIZATION OF MAGNESIUM SLURRIES, by John Bitten. Rept. on Contract AF 33(616)5147. Oct 57, declassified. 94p. WADC Technical rept. 57-710; AD-142 176.

DESCRIPTORS: *Jet engine fuels, Stability, *Magnesium, Propellant properties, Fuels, Ball mills, Wetting agents.

A limited study was made of the preparation and stabilization of magnesium powder in JP-4 fuel. By using instrumental methods based on sedimentation, microscopy, and rheology, an investigation was made of surfactants which would induce compatibility between the solid metal and the liquid phases. Agents were found which will fluidize vapor process slurries which have gelled to a plastic, puttylike consistency for long storage periods. Milling studies showed that highly fluid magnesium-JP-4 slurries of submicron particle size can be made by ball milling magnesium powder in JP-4 fuel containing wetting agents. Success of the milling operation depends on the type and concentration of surfactants and on the length of the milling period. In addition to the stabilization studies, a general evaluation was made of the effects of magnesium oxide exhaust products in terms of toxicity, corrosion, and fallout. (Author)

NASA N62-10342 $1.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena, Calif.
AN EXPERIMENTAL INVESTIGATION OF THE PERFORMANCE OF THE NITROGEN TETROXIDE-HYDRAZINE SYSTEM IN THE OXIDIZER-RICH AND FUEL-RICH REGIONS, by J. J. Chilenski and D. H. Lee. Rept. on Contract NAS7-100. 12 Mar 62, 13p. 16 refs. Technical rept. no. 32-212; AD-273 502.

NASA N62-10432 $1.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
STABILITY TESTS OF MONOPROPELLANTS EXPOSED TO FLAMES AND RIFLE FIRE, by G. S. Glatts. Rept. on Contracts NAS7-100 and DA 04-495-ORD-18. 26 Feb 62, 18p. Technical rept. no. 32-172; AD-273 501.

NASA N62-14820 $1.00

Lewis Research Center, National Aeronautics and Space Administration, Cleveland, Ohio.
AN INVESTIGATION OF THE LIQUID LEVEL AT THE WALL OF A SPINNING TANK, by David M. Winch. Aug 62, 38p. 3 refs. NASA TN-D-1536.

## MATHEMATICS

PB 162 074 $12.50

Engineering Statistics Lab., New York U., N.Y.
ON THE JOINT ESTIMATION OF THE SPECTRA, COSPECTRUM AND QUADRATURE SPECTRUM OF A TWO-DIMENSIONAL STATIONARY GAUSSIAN PROCESS, by N. R. Goodman. Doctoral thesis. Technical rept. no. 8 on Contracts NObs-72018 and Nonr-28517. Mar 57, 172p. ESL Scientific paper no. 10; AD-134-919.

DESCRIPTORS: *Statistical processes, Probability, Statistical functions, Sampling.

The probability structure of a real two-dimensional stationary (zero mean) Gaussian vector process $[x(t), y(t)]$, $-\infty < t < \infty$, is specified (in the absolutely continuous case) by $f_{xx}(\lambda)$, $f_{yy}(\lambda)$ the spectral densities of the x(t) and y(t) processes respectively, $c(\lambda)$ the cospectral density, and $q(\lambda)$ the quadrature spectral density $(-\infty < \lambda < \infty)$. The dissertation treats the problem of jointly estimating (in a suitable sense) $f_{xx}(\lambda)$, $f_{yy}(\lambda)$, $c(\lambda)$, $q(\lambda)$ from a finite part of a sample function of the $[x(t), y(t)]$, $-\infty < t < \infty$, process. An approximation to the joint sampling distribution of the estimators for $f_{xx}(\lambda)$, $f_{yy}(\lambda)$, $c(\lambda)$, $q(\lambda)$ is obtained. This approximate sampling distribution termed a Complex Wishart distribution serves as the starting point in the derivation of approximate sampling distributions of estimators for functions of $f_{xx}(\lambda)$, $f_{yy}(\lambda)$, $c(\lambda)$, $q(\lambda)$. The dissertation was motivated by the need of experimenters in fields such as micrometeorology, oceanography, electrical engineering, and aeronautical engineering to statistically estimate "parameters" characterizing their particular physical systems and to treat the sampling variability of estimators for the "parameters". In a number of cases the "parameters" to be estimated are functions of the densities $f_{xx}(\lambda)$, $f_{yy}(\lambda)$, $c(\lambda)$, $q(\lambda)$ of a real two-dimensional stationary (zero mean) Gaussian vector process. (Author)

PB 162 097 $15.50

Military Physics Research Lab., U. of Texas, Austin.
MATHEMATICAL PROCESSES: SETS OF COEFFICIENTS FOR DATA PROCESSING FORMULAS, by Evelyn Welborn. Rept. on Contract AF 33(616)3985. 5 May 59, 237p. 3 refs. Rept. no. MPRL 475. AD-232 593.

DESCRIPTORS: *Digital computers, Programming, Data, Processing, Numerical methods and procedures, *Operators (Mathematics), Operation, Functions, *Tables, Polynomials.

Formulas and associated tables of coefficients are presented for the processing of discrete data with digital computers. The formulas and coefficients are computed by methods using a linear operator on experimental data for smoothing, differentiation, integration, interpolation, and prediction. A total of 138 sets of coefficients is given, and each set can be used to construct many different formulas. Special formulas can be constructed for particular applications. The formulas are designed to leave polynomials of fixed degree unchanged and to minimize the effects of noise. These formulas can handle any number of data points, and are suitable when a limited amount of data is available for each computation. (Author)

PB 162 150 $4.60

Operations Research Office, Johns Hopkins U., Bethesda, Md.
HISTORY AND BIBLIOGRAPHY OF WAR GAMING, by John P. Young. Apr 57, 47p. 10 refs. Staff Paper ORO-SP-13; AD-235 893.

DESCRIPTORS: *Games theory, *Warfare, History, Bibliography.

PB 162 151 $11.00

Operations Research Office, Johns Hopkins U., Bethesda, Md.
MATHEMATICAL MODELS FOR GROUND COMBAT, by George A. Gamow and Richard E. Zimmerman. Apr 57, 146p. Staff Paper no. ORO-SP-11; AD-235 891.

DESCRIPTORS: *Combat, Numerical methods and procedures, *Games theory, Digital computers, Programming; Warfare.

Contents:
Analytical calling the reserve problem: balance of speed vs vulnerability
A model for the study of tactical reserve formations
Monte Carlo method in war-game theory
The application of electronic computers to Monte Carlo war game problems
Programming a set piece type war game for machine calculation
Maximum complexity computer battle.

SCR-499 $0.75

Sandia Corp., Albuquerque, N. Mex.
ON RICCATI AND RICCATI-LIKE EQUATIONS ARISING IN ONE DIMENSIONAL DIFFUSION PROBLEMS, by I. I. Kolodner, J. Lehner, and G. M. Wing. Rept. on Contract AT-(29-1)-789. Apr 62, 31p.

## Computing Devices

NASA N62-15530 $1.60

Arizona U., Tucson.
A DEVICE FOR RESEARCH IN HUMAN INFORMATION PROCESSING CAPACITY, by Ridgely W. Chambers and Neil R. Bartlett. Rept. on Grant NsG-191-62. [1962] 18p.

NAA-SR-MEMO-7347 $3.60

Atomics International, Canoga Park, Calif.
MACE: A MONTE CARLO EVALUATION OF FAST NEUTRON COLLIMATORS, by R. E. Kaiser, W. J. Roberts, and K. L. Rooney. 27 Apr 62, 34p.

NAA-SR-7357 $1.25

Atomics International, Canoga Park, Calif.
TYCHE, A MONTE CARLO SLOWING DOWN CODE, by R. A. Blaine. Rept. on Contract AT(11-1)-GEN-8. 30 June 62, 51p. 15 refs.

GAMD-2797 (Vol. II) $21.00

General Atomic Div., General Dynamics Corp., San Diego, Calif.
DDB:A TWO DIMENSIONAL REACTOR DIFFUSION CODE WITH CRITICALITY SEARCH AND BURNOUT OPTIONS II. THE PROGRAM, by J. H. Alexander, C. Cyl-Champlin and others. Rept. on Contract AT(04-3)-314. 15 Mar 62, 364p.

UCRL-6782 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
KEY WORD IN TITLE (KWIT) INDEX FOR REPORTS, by Frank V. Giallanza and James H. Kennedy. Rept. on Contract W-7405-eng-48. 14 May 62, 10p. 2 refs.

UCRL-10059 $1.50

Lawrence Radiation Lab., U. of California, Berkeley.
ORGANIZATION OF MULTIPLE OUTPUT FUNCTIONS, by Peter White. Master's thesis. Rept. on Contract W-7405-eng-48. 8 Feb 62, 67p. 8 rers.

UCRL-6523 $0.75

Lawrence Radiation Lab., U. of California, Livermore.
THE SAPIR PROGRAM OF AUTOMATIC PROCESSING SYSTEM AND INDEXING OF REPORTS, by Lester Douglas Turner. Rept. on Contract W-7405-eng-48. 27 May 61, 29p.

PB 162 156 $9.60

[United] Nuclear Corp., White Plains, N. Y.
A DESCRIPTION OF MIS, A MONTE CARLO INELASTIC SCATTERING CODE FOR THE DATATRON COMPUTER, by Florence Jeanne Oswald and Roberta Schaffer. Rept. on Contract Nonr-125800. 30 June 57, 114p. Rept. no. NDA 2-66; AD-234 650.

DESCRIPTORS: *Digital computers, *Coding, *Neutron absorption, *Reactor shielding calculations, Shielding, Neutron scattering, Numerical methods and procedures, *Neutron flux density.

The function of the MIS (Monte-Carlo Inelastic Scattering) code is to calculate neutron flux as a function of energy and position in a spherical reactor. The code actually calculates average track length per neutron per energy group in each region. To convert this into flux it is necessary to divide the track length by the volume of the region and the region weighting factor. In order to avoid cumbersome language the machine output is referred to as flux. There are 2 independent versions of the code, (MIS I, MIS II) which differ only in the MIS I calculates flux in equally spaced energy groups while MIS II calculates flux in equally spaced lethargy groups. Each version calculates neutron current in both directions across every boundary in the reactor, neutron leakage out of the entire assembly, and the number of neutrons absorbed and the number degraded below some given energy in each region. The code calculates the standard deviation of the flux estimate which allows the user to evaluate the statistical error in the answer. The Monte Carlo technique used simulates digitally the life histories of neutrons in the reactor. (Author)

## MECHANICS

NAA-SR-5676 $0.75

Atomics International, Canoga Park, Calif.
INELASTIC STRESS IN A LONG CYLINDRICAL SHELL UNDER A BAND OF PRESSURE, by T. C. Yen. Rept. on Contract AT(11-1)-GEN-8. 30 July 62, 36p. 6 refs.

NYO-10093 $2.60

Dynatech Corp., Cambridge, Mass.
TWO PHASE FLOW THROUGH A VERTICAL VENTURI, by Raphael Moissis and Nick A. Radovcich. Topical rept. no. 4, on Contract AT(30-1)-2907. 24 July 62, 23p. 19 refs. Rept. no. 321.

PB 162 228 $4.60

Gas Turbine Lab., Mass. Inst. of Tech., Cambridge.
EXPERIMENTAL TECHNIQUES FOR THREE-DIMENSIONAL FLOW RESEARCH, by Raymond W. Moore, Jr., Warren G. Nelson and others. Rept. for 1953-1954, on Three-Dimensional Flow in Turbomachine Research and Shear Flow in Bends, Contract N5ori-07848. Dec 54, 46p. Rept. no. 27-8; AD-50 612.

DESCRIPTORS: *Fluid flow, Analysis, *Axial flow compressors, Design, Gas turbines, Propulsion.

A review is given of the following experimental techniques for 3-dimensional flow research: compressor and cascade measurements, streamline tracing, and the use of velocity profile generators. The techniques for measuring the static pressure, stagnation pressure, and the steam direction in a compressor are presented, along with a description of the single-stage compressor (AD-50 613) used. A 3-dimensional traversing rig for measuring stagnation pressure, overturning angle, and spanwise deviation angle in a low-speed cascade is described. The visualization of flow patterns on blade surfaces by coating them with carbon black is discussed. A comparison was made of methods of streamline tracing which involve following the wake of a body placed in a stream. Two types of wakes were studied: stagnation-pressure wakes behind round wires and thin flat plates, and temperature wakes behind heated round wires. The pressure wakes were easier to trace because of the simpler instrumentation required. However, these wake-tracing methods were impractical within the boundary layers under study. Analysis of a flatplate type of velocity-profile generator revealed that the static pressure behind the generator was uniform across the flow, which greatly simplified the treatment. Good correlation was obtained between design and test results when the grid was designed on this basis. An annular profile generator designed by an extension of this method is also described.

NASA N62-10214 $1.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE FREE-SURFACE BOUNDARY CONDITIONS WITH SURFACE TENSION, by H. E. Williams. Rept. on Contract NASw-6. 1 Dec 61, 15p. 2 refs. Technical rept. no. 32-88.

NASA N62-10216 $1.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A LIMIT ANALYSIS OF THE COLLAPSE OF HEXAGONAL CELL STRUCTURES UNDER AXIAL LOAD, by R. K. McFarland, Jr. Rept. on Contract NASw-6. 1 Dec 61, 17p. 9 refs. Technical rept. no. 32-186.

NASA N62-10219 $1.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ON THE MOTION OF A CONDUCTING FLUID PAST A FINITE CYLINDRICAL BODY IN THE PRESENCE OF A STRONG MAGNETIC FIELD, by Stephen Childress. Rept. on Contract NASw-6. 21 Dec 61, 12p. 6 refs. Technical rept. no. 32-200.

NASA N62-10220 $1.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RECIRCULATION OF A TWO-PHASE FLUID BY THERMAL AND CAPILLARY PUMPING, by J. H. Laub and H. D. McGinness. Rept. on Contract NASw-6. 8 Dec 61, 11p. 3 refs. Technical rept. no. 32-196.

NASA N62-10218 $1.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TRANSIENT RESPONSE AND STEADY-STATE TEMPERATURE DISTRIBUTION IN A HEATED, RADIATING, CIRCULAR PLATE, by R. S. Hickman. Rept. on Contract NASw-6. 22 Nov 61, 19p. 4 refs. Technical rept. no. 32-169.

NASA N62-14795 $3.60

New York U. Coll. of Engineering, N. Y.
EXPERIMENTS ON AXIAL COMPRESSIVE GENERAL INSTABILITY OF MONOLITHIC CIRCUMFERENTIALLY STIFFENED CIRCULAR CYLINDRICAL SHELLS, by Herbert Becker, George Gerard, and Robert Winter. Rept. on Grant NsG-17-59. May 62, 40p. 7 refs. Technical rept. SM-62-5.

NASA N62-10059 $3.60

Southwest Research Inst., San Antonio, Tex.
BREATHING VIBRATION OF A CIRCULAR CYLINDRICAL SHELL CONTAINING AN INTERNAL LIQUID, by H. Norman Abramson, Daniel D. Kana, and Ulric S. Lindholm. Technical rept. no. 3 on Contract NASw-146. Feb 62, 34p. 8 refs.

NASA N62-15172 $1.10

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
AN INVESTIGATION OF UNSTABLE SHEAR FLOWS AND THEIR RELATION TO AERODYNAMIC NOISE by Erik Mollo-Christensen. Interim rept. 15 Aug 61-15 Feb 62, on Grant NsG-31-60. [1962] 4p.

NASA N62-15071 $1.50

Ames Research Center, National Aeronautics and Space Administration, Moffett Field, Calif.
RADIATIVE HEAT TRANSFER AND ABSORPTION BEHIND A HYPERSONIC NORMAL SHOCK WAVE, by Kenneth K. Yoshikawa and Dean R. Chapman. Sep 62, 59p. 21 refs. Technical note D-1424.

NASA N62-15238 $4.60

Committee on Space Research (COSPAR), The Hague (Netherlands).
AERODYNAMIC ANALYSIS OF TEKTITES AND THEIR PARENT BODIES, by E. W. Adams and R. M. Hauffaker. [1962] 47p. 24 refs.

Presented at Third International Space Science Symposium and Fifth COSPAR Plenary Meeting, Washington, 30 Apr-9 May 62.

NASA N62-15656 $1.10

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
COMPARISON OF EXACT AND APPROXIMATE SOLUTIONS FOR NONEQUILIBRIUM NOZZLE FLOWS, by John A. Lordi. Rept. on Contracts NAS5-670, NASr-109, and AF 49(638)782. [1962] 6p. 7 refs.

PB 162 227 $1.60

Institute of Engineering Research, U. of Calif., Berkeley.
A NOTE ON THE EFFECT OF SLIP ON THE DRAG OF A FINITE FLAT PLATE, by J. A. Laurmann. Technical rept. on Fluid Flow and Heat Transfer at Low Pressures and Temperatures, N7onr-295, T.O. 3. 12 July 54, 18p. Rept. no. HE-150-123; Series no. 20, issue no. 99; AD-42 324.

DESCRIPTORS: *Sheets, Drag, Boundary layer, *Fluid flow, *Fluid mechanics, Partial differential equations, Reynolds number.

A method of Kuo (J. Math. and Phys. 32, no. 2-3:83-101, 1953) for the solution of the 2-dimensional Navier-Stokes equations for the incompressible flow over a finite plate is applied to the case in which there is a finite velocity of slip at the plate surface. The analysis is based on the assumption that it is possible to represent the velocity and the shear at the plate by asymptotic expansions in the parameter $= (Re_L)^{-1/2}$, where $Re_L$ is the Reynolds number based on the plate length. The analysis shows that the total drag is unaffected by slip to the second order.

NASA N62-15055 $1.00

Lewis Research Center, National Aeronautics and Space Administration, Cleveland, Ohio.
DESIGN AND CALIBRATION OF AN ARC-HEATED, HYPERSONIC, LOW-DENSITY WIND TUNNEL, by Ruth N. Weltmann. Aug 62, 33p. 25 refs. Technical note D-1169.

PB 162 147 $6.60

Polytechnic Inst. of Brooklyn, N. Y.
EXPERIMENTAL INVESTIGATION OF TIP-CLEARANCE FLOW IN CASCADES, by Wen Wu and Clifford A. Wojan. Technical rept. no. 2 on Contract Nonr-839(04). Sep 55, 65p. AD-76 598.

DESCRIPTORS: *Fluid flow, Experimental data, *Compressor blades, *Turbine blades, Aerodynamics, Load blades, Aerodynamics, Load distribution, Pressure, Fluid mechanics.

A study was made to determine (1) the tip-clearance effect on the pressure distribution on the tip-end surface and the pressure loading at various stations on the blade surface, (2) the tip-clearance effect on the outlet total pressure, and (3) the moving-wall effect on these quantities. Results showed that the tip clearance affected mainly pressure loading at the blade-tip section and had little effect on the middle section. At small tip-clearance, the pressure distribution on the tip-end surface was complicated. Peak pressures occurred on the central portion of the end surface, and the pressure gradient along the edges varied from the leading edge to the trailing edge. Pressure loading along the tip-end surface edges was appreciably different from that on the main-stream blade surface. The thickness distribution of the airfoil section influenced the tip-clearance flow. The moving wall tended to drag its adjacent fluid with it in passing through the tip-clearance space and had little effect on the pressure loading on the blade surface. The moving wall reduced the pressures on the tip-end surface but not the pressure differences between the edges of the blade tip.

PB 162 153 $2.60

Polytechnic Inst. of Brooklyn, N. Y.
NOTE ON THE FLOW FIELDS ON THE REAR OF BLUNT BODIES IN HYPERSONIC FLOW, by Antonio Ferri and Adrian Pallone. Rept. on Aerodynamic Research, Contract AF 33(616)3265. July 56, 27p. WADC Technical note no. 56-294; AD-97-239.

DESCRIPTORS: *Blunt bodies, Wedges, *Bodies of revolution, Gas flow, *Hypersonics, Thermodynamics, Entropy.

At high Mach numbers the pressure on the rear part of blunt bodies is higher than free stream, and the heat transfer on the afterbody can be important. At the same time entropy gradients produce reflected waves which at high Mach numbers cannot be neglected. Heat transfer data obtained at low Mach numbers cannot be extrapolated directly to high Mach numbers since the balance of importance between heat transfer on the front part and on the rear part of the body changes rapidly with Mach number. There is a possibility of determining the base pressure of blunt bodies in hypersonic flight by utilizing data obtained at lower Mach numbers. (Author)

## Hydrodynamics, Hydraulics, and Hydrostatics

UCRL-10097 $3.50

Lawrence Radiation Lab., U. of California, Berkeley.
A HYDRODYNAMIC MECHANISM FOR THE COALESCENCE OF LIQUID DROPS, by Sidney B. Lang. Doctoral thesis. Rept. on Contract W-7405-eng-48. May 62, 266p. 86 refs.

UCRL-6797 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
SHOCK HYDRODYNAMICS, by Mark L. Wilkins. Rept. on Contract W-7405-ENG-48. 19 Feb 62, 25p.

LA-2703 $1.00

Los Alamos Scientific Lab., N. Mex.
THE HYDRODYNAMIC HOT SPOT AND SHOCK INITIATION OF HOMOGENEOUS EXPLOSIVES, by Charles L. Mader. Rept. on Contract W-7405-eng-36. 18 July 62, 43p. 19 refs.

PB 162 080 $2.60

Southwest Research Inst., San Antonio, Tex.
A PRELIMINARY ANALYSIS OF NONLINEAR COUPLED PITCHING AND HEAVING MOTIONS AND SLAMMING CONDITIONS FOR A SHIP IN REGULAR WAVES, by Wen-Hwa Chu and H. Norman Abramson. Technical rept. no. 3 on Contract Nonr-272900. 30 Sep 60, 30p. AD-251 928.

DESCRIPTORS: Motion, Water waves, *Ships, Impact shock, *Hydrodynamics, *Dynamics, Marine engineering.

The strip method is employed to approximate the motions of a long ship in a regular sea. The amplitude of the motion and the slope of wave components are assumed to be only moderately small, and bow emergence is allowed. Only elementary hydrodynamic theory is employed, including some approximate refinements. Graphical or numerical integration of the resultant dynamic equations in simultaneous phase planes is described. (Author)



NAA-SR-7293 $0.75

Atomics International, Canoga Park, Calif.
FABRICATION OF CERAMIC INTERNAL REFLECTOR FOR THE SNAP 8 EXPERIMENTAL REACTOR, by K. Langrod. Rept. on Contract AT(11-1)-GEN-8. 15 July 62, 37p. 5 refs.

BMI-X-10011 $2.60

Battelle Memorial Inst., Columbus, Ohio.
CRACK INITIATION AND PROPAGATION IN URANIUM AT ELEVATED TEMPERATURES, by N. E. Daniel, F. R. Shober and others. 1 Aug 62, 29p.

BMI-1586 $0.50

Battelle Memorial Inst., Columbus, Ohio.
STUDY OF EXPERIMENTAL FUEL BODIES MADE FROM ALUMINA-COATED $UO_2$ PARTICLES, by Stan J. Paprocki, Donald L. Keller, and William M. Pardue. Rept. on Contract W-7405-eng-92. 16 July 62, 21p. 1 ref.

DRI-2043 $3.60

Denver Research Inst., Colo.
AN INVESTIGATION OF THE EFFECT OF METALLIC ADDITIONS UPON THE OXIDATION RESISTANCE OF $NbAl_3$, by Ronald L. Wells, Donald T. Klodt, and Charles E. Lundin. Quarterly progress rept. no. 2, 1 Mar-31 May 62, on Contract AT(11-1)-1092. June 62, 33p. 5 refs.

PB 162 065 $1.60

Illinois Inst. of Tech., Ill.
THE REACTION BETWEEN URANIUM AND OXYGEN, by Daniel Cubicciotti. Technical rept. no. 10 on The Reactions of Metals with Gases and Salts at High Temperatures, Contract N7onr-329, T.O. 2. Apr 51, 19p. 4 refs. ATI-123 346.

DESCRIPTORS: *Uranium, Heat treatment, Oxygen, Chemical reactions, Oxidation, Thermal stresses.

The rate of oxidation of uranium was determined in the temperature range 90 to 240°C. The reaction followed the parabolic oxidation law from 90 to 165° and the linear above 165°. The transition from parabolic to linear, observed in several oxidations, is considered. The transition is possibly due to cracking of the oxide caused by excessive strain in the oxide. (Author)

NASA N62-14821 $2.25

Lewis Research Center, National Aeronautics and Space Administration, Cleveland, Ohio.
INFLUENCE OF CERTAIN COMPOSITION AND FABRICATION VARIABLES ON THE STRESS-RUPTURE PROPERTIES OF A COBALT-BASE ALLOY CONSOLIDATED BY POWDER METALLURGY, by Philip A. Clarkin, John W. Weeton, and Paul F. Sikora. Aug 62, 87p. 8 refs. NASA TN-D-1221.

NYO-9435 $2.60

Massachusetts Inst. of Tech., Cambridge.
ATOM ARRANGEMENTS IN SOME IRON ALUMINUM SOLUTIONS, by C. R. Houska and B. L. Averbach. 12 July 62, 24p. 13 refs.

NYO-9436 $3.60

Massachusetts Inst. of Tech., Cambridge.
A THEORETICAL TREATMENT OF ATOMIC CONFIGURATIONS FOUND IN SOME IRON-ALUMINUM SOLID SOLUTIONS, by C. R. Houska. 12 July 62, 35p. 14 refs.

PB 181 408 $1.25

Material Lab., New York Naval Shipyard [Brooklyn].
INVESTIGATION OF THE NOTCH-TOUGHNESS PROPERTIES OF ABS SHIP PLATE STEELS, by J. J. Gabriel and E. A. Imbembo. Final rept. on Contract NObs-84321. 1 Oct 62, 41p. 12 refs. Serial no. SSC-142

DESCRIPTORS: Merchant vessels, *Ship plates, *Steel, Mechanical properties, Tensile properties, *Metal plates, Sheets.

SR-125 was initiated for the purpose of surveying notch-toughness properties of ship plate procured by various shipyards for merchant ship construction under ABS rules. The main objective was to determine the extent to which post World War II steels have been improved, based principally on a comparison of their Charpy V-notch properties with those established by the National Bureau of Standards for fractured plates from World War II ships. The initial part of the program (prior to 1956) covered plate procured to the requirements of the 1948 ABS Rules and included 37 samples of Class A, 81 of Class B and 14 of Class C. In view of the 1956 changes in the ABS Rules, the sampling program was extended to cover primarily the new Class B type but some additional samples of Class C were included to supplement the relatively small number received in the previous sampling. The extended program included 76 samples of Class B and 12 of Class C. The results of the survey indicate that since the 1956 revision of the ABS Rules for Ship Steel, the range and average transition temperatures (15 ft-lb Charpy V) for the new material have been found to be -40 to 29 F and 2 F, respectively, for ABS Class B plates, and -46 to 13 F and -13 F, respectively, for ABS Class C plates, as compared with an average of 90 F for World War II fracture-source plates and 68 F for fracture-through plates.

TID-16368 $2.60

Materials Science Center, Cornell U., Ithaca, N. Y.
DISLOCATION AND GRAIN BOUNDARY SHORT CIRCUITING MODELS FOR STRAIN ENHANCED DIFFUSION IN METALS. PART II, by A. L. Ruoff and R. W. Balluffi. 6 Aug 62, 24p. 21 refs. MSC-47.

NASA N62-10067 $1.10

Midwest Research Inst., Kansas City, Mo.
AUTORADIOGRAPHY OF FATIGUE FRACTURE IN ALUMINUM, by J. C. Grosskreutz, Rept. on Contract NASr-63(02). [1961] 4p. 6 refs.

NMI-7217 $2.60

Nuclear Metals, Inc., Concord, Mass.
EVALUATION OF ZIRCALOY CLAD U - 0.3 $^{W}/_{o}$ Al - 0.5 $^{W}/_{o}$ Si TUBE NO. 135, by W. J. Richmond. 29 June 62, 27p.

NASA N62-15678 $1.60

Syracuse U. Research Inst., N. Y.
ADHESION BETWEEN ATOMICALLY CLEAN METALLIC SURFACES. PART I. BULK ADHESION, by T. Spalvins (Master's thesis) and D. V. Keller. Rept. on Grant NsG-159-61. June 62, 12p. 11 refs.

PB 162 070 $1.60

Westinghouse [Electric Corp.] Pittsburgh, Pa.
RESEARCH AND DEVELOPMENT IN HIGH STRENGTH HEAT RESISTANT ALLOYS, by L. L. France. Interim rept. no. 1, 27 June-28 Aug 58, on Contract NOas 58-582-c. [1958] 12p. AD-203 848.

DESCRIPTORS: *Heat resistant alloys, Mechanical properties, Oxidation, *Tantalum alloys, *Tungsten alloys, Melting, Electric arcs, Manufacturing methods, Extrusion

This contract has its object the development of high strength heat resistant alloys based upon the metals tantalum and tungsten and containing appreciable percentages of rhenium, hafnium, zirconium, titanium, osmium, molybdenum, niobium or other high melting metals. The mechanical properties and oxidation resistance of these alloys will be determined with emphasis being placed on these properties at temperatures above 1750°F. A survey was made of the commercial availability and purity of the metals to be used in this work and these metals are currently being ordered. Emphasis was placed on the construction of new equipment or modification of existing equipment to handle these materials. The possibility of using levitation melting as a means of preparing these alloys is currently being examined and a somewhat cursory literature survey concerned only with the alloy systems of interest was initiated. (Author)

## Structural Metallurgy and Corrosion

PB 162 084 $7.60

Illinois U. Engineering Experiment Station, Urbana.
AN INVESTIGATION OF STRAIN AGING IN FATIGUE, by J. C. Levy and G. M. Sinclair. Technical rept. no. 39 on the Behavior of Materials Under Repeated Stress, Contract N6ori-07104. Aug 54, 74p. 33 refs. AD-37 257.

DESCRIPTORS: *Metals, *Fatigue (Mechanics), Test methods, *Steel, Deformation, Tensile properties, Statistical analysis, Aging, Diffusion, Dislocation, Crystals, Lattices.

Fatigue tests were conducted on low-C steel at a rate of 2600 c/min, at temperatures up to 700°F, and at a constant stress amplitude of 35,000 psi. Statistical analysis of results indicated that a peak occurred in the 450°F region; a tendency was observed for the scatter in life to increase as the mean life increased. The magnitude of the observed peak depended upon the amount of C and N in solid solution; this effect was classified, therefore, as a strain-aging effect. When C and N were present, the peaking temperature was somewhat higher than when N alone was present; this phenomenon indicated an interaction between the 2 types of interstitial atoms. In the application of a recently developed strain-aging theory (Cottrell, A. H. Dislocations and Plastic Flow in Crystals, Chapter 4, Clarendon Press, Oxford, 1953), C and N atoms were presumed to strengthen the metal by diffusing to dislocations in the crystal lattice. Results of this application indicated that the calculated peaking temperature agreed with the observed value. A curve of the predicted temperature for peak life was constructed over a wide range of cyclic rates.

PB 162 083 $2.60

Institute of Engineering Research, U. of California, Berkeley.
THE EFFECT OF DISPERSIONS ON THE CREEP PROPERTIES OF ALUMINUM-COPPER ALLOYS, by Warren H. Giedt, Oleg D. Sherby, and John E. Dorn. Technical rept. no. 22 on Contract N7onr-295, T. O. 2, 1 Dec 52, 28p. Series 22, issue 22; AD-691.

DESCRIPTORS: *Aluminum alloys, *Copper alloys, *Creep, Resistance, Heat treatment, Stresses, Phase studies.

The creep properties of Al-Cu alloys containing dispersions of $CuAl_2$ in the $\alpha$ solid-solution matrix of Al were primarily dependent on the volumetric mean free path ( ) between the $CuAl_2$ particles and independent of minor variations in composition (3 to 5% Cu) and heat treatment. The creep stress correlated with the creep rate-temperature parameter

$$Z = \dot{\epsilon}_s e^{\Delta H/RT},$$

where $\dot{\epsilon}_s$ is the secondary creep rate, $\Delta H$ the activation energy, R the gas constant, and T the absolute temperature during creep. Above $\ln Z = 46$ and below $\ln Z = 27.5$, the finer dispersions exhibited superior creep resistance; in the intervening range, the coarser dispersions were superior. $CuAl_2$ dispersions increased the Al creep resistance above that obtained by alloying with Cu. $\Delta H$ was a constant of about 37,000 cal/mol. Constant-load creep strains for dispersion alloys appeared to be functions of the initial stress and the temperature-compensated time, analogous to the creep behavior of $\alpha$ solid solutions.

## NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

ANL-6546 $0.50

Argonne National Lab., Ill.
CHLORINATION OF URANIUM AND FISSION PRODUCT OXIDES IN MOLTEN HALIDE MEDIA, by J. P. LaPlante, D. A. Wenz, and R. K. Steunenberg. Rept. on Contract W-31-109-eng-38. May 62, 10p. 7 refs.

ANL-6577 $0.50

Argonne National Lab., Ill.
A GENERALIZED PROCEDURE FOR THE ISOLATION OF IODINE WITHOUT CARRIER--ITS DETERMINATION BY NEUTRON ACTIVATION USING $I^{129}$ AS AN ISOTOPIC TRACER, by Martin H. Studier, Clarence Postmus, Jr. and others. Rept. on Contract W-31-109-eng-38. July 62, 10p. 4 refs.

BNL-716(L-326) $0.50

Brookhaven National Lab., Upton, N. Y.
BIBLIOGRAPHY ON GAMMA-RAY RADIOGRAPHY 1950 TO 1961 INCLUSIVE WITH SUBJECT AND AUTHOR INDICES, by Jere C. Austin. Mar 62, 21p.

BNL-722(T-256-92-94-1) $0.75

Brookhaven National Lab., Upton, N. Y.
LEAST SQUARES ANALYSIS OF THE 2200 m/sec PARAMETERS OF $U^{233}$, $U^{235}$, AND $Pu^{239}$, by Rudolph Sher and Joan Felberbaum. June 62, 25p. 7 refs.

BNL-740(T-268) $1.00

Brookhaven National Lab., Upton, N. Y.
POLYMERIZATION OF ETHYLENE BY COBALT-60 GAMMA RADIATION, by Meyer Steinberg, P. Colombo and others. Radiation processing rept. no. 4. July 62, 42p. 13 refs.

HW-73482 $1.60

Hanford Atomic Products Operation, Richland, Wash.
CRIB DISPOSAL OF THE NPR DECONTAMINATION WASTES, by D. W. Bensen. Rept. on Contract AT(45-1)-1350. 10 May 62, 15p. 5 refs.

HASL-125 $3.60

Health and Safety Lab., Atomic Energy Commission, New York.
THE CALCULATION OF SOME BESSEL FUNCTIONS FOR CRITICALITY PROBLEMS, by Edward Katine. May 62, 35p. 6 refs.

JLI-650-8-8 $3.00

Johnston, William H., Labs., Inc., Baltimore, Md.
BASIC STUDIES IN RADIATION TECHNOLOGY. Final rept. 2 Nov 59-31 Oct 61, on Contract AT(11-1)-650. Jan 62, 224p. 38 refs.

UCRL-10274 $2.00

Lawrence Radiation Lab., U. of California, Berkeley.
THE NMR RELAXATION MECHANISM OF $O^{17}$ IN AQUEOUS SOLUTIONS OF PARAMAGNETIC CATIONS AND THE LIFETIME OF WATER MOLECULES IN THE FIRST COORDINATION SPHERE, by Terrence James Swift. Thesis. Rept. on Contract W-7405-eng-48. May 62, 83p. 33 refs.

UCRL-10109 $0.75

Lawrence Radiation Lab., U. of California, Berkeley.
SMP-1 SCANNING AND MEASURING PROJECTOR, by Luis W. Alvarez, Peter Davey and others. Rept. on Contract W-7405-eng-48. 10 Apr 62, 34p. 2 refs.

NYO-10200 $2.60

Little, Arthur D., Inc., Cambridge, Mass.
A STUDY OF RADICAL MOLECULE COMPLEXES AS INTERMEDIATES IN LOW TEMPERATURE RADIATION CHEMISTRY. Quarterly rept. Apr-June 62, on Contract AT(30-1)-2977. 25 June 62, 26p. 1 ref.

LAMS-2721 $0.50

Los Alamos Scientific Lab., N. Mex.
THE LASL CONTROLLED THERMONUCLEAR RESEARCH PROGRAM. Quarterly status rept. for period ending 20 May 62, on Contract W-7405-eng-36. 20 June 62, 18p. 2 refs.

NLCO-855 $2.00

National Lead Co. of Ohio, Cincinnati,
SUMMARY TECHNICAL REPORT, 1 Apr-30 June 62, on Contract AT(30-1)-1156. 25 July 62, 84p. 25 refs.

PB 162 069 $8.10

Northwestern U., Evanston, Ill.
A STUDY OF NEUTRON ABSORPTIOMETRY AND ITS APPLICATION TO THE DETERMINATION OF BORON, by D. D. DeFord and R. S. Braman. Rept. on Subcontract to Contract NOas-52-1024-c. 17 May 57, 87p. 15 refs. Rept. no. CCC-1024-TR-243; AD-138 098.

DESCRIPTORS: *Radiochemistry, *Boron, Determination, Absorption, Neutrons

A systematic study of both the practical and theoretical aspects of neutron absorptiometry has been made, and it has been shown that this method possesses many advantages for the determination of elements, such as boron, which have high neutron absorption cross sections. The optimum geometrical arrangement of neutron source, neutron moderator, sample, and neutron detector has been worked out, and it has been found that precise determinations of boron can be carried out in a few minutes with relatively small, safe, and inexpensive neutron sources. The method is nondestructive, the state of chemical combination is immaterial, and there are few interferences. The most serious disadvantages of the method are its low sensitivity and the requirement for relatively large samples if highest precision is to be realized. (Author)

ORNL-TM-157 $4.60

Oak Ridge National Lab., Tenn.
UNIT OPERATIONS SECTION MONTHLY PROGRESS REPORT, FEBRUARY 1962, by M. E. Whatley, P. A. Hass and others. 23 Aug 62, 47p.

DP-727 $0.50

Savannah River Lab., Aiken, S. C.
A METHOD FOR DETERMINING THE DIFFUSION COEFFICIENT OF AN ALPHA EMITTER IN A SOLID, by LeVerne P. Fernandez. Rept. on Contract AT(07-2)-1. May 62, 12p. 9 refs.

PB 162 075-2 $1.60

Stevens Inst. of Tech., Hoboken, N. J.
MEGATRON ACCELERATOR, by K. C. Rogers, G. Brucker and others. Quarterly progress rept. no. 2, 1 Oct-31 Dec 58, on Investigation of Plasma Acceleration, Contract DA 36-039-sc-78097. [1959] 18p. AD-214 249.

DESCRIPTORS: Accelerators, *Betatrons, *Plasma physics, Electron tubes, Vacuum switches, Magnetic fields, Measurement.

Design was initiated for the construction of the megatron, a high flux density, high current betatron (150 Mev 1000 A). Possible methods of shaping pulsed magnetic field are described, and measuring techniques are indicated for application to an air core betatron. A sand loaded epoxy vacuum chamber is described and its use in a high voltage—high current switch is suggested. (See also PB 162 075-1) (Nuclear Physics and Nuclear Chemistry, 5 Dec 62)

PB 162 075-4 $2.60

Stevens Inst. of Tech., Hoboken, N. J.
MEGATRON ACCELERATOR, by K. C. Rogers, D. Finkelstein, and others. Quarterly progress rept. no. 4, 1 Apr-30 June 59, on Investigation of Plasma Acceleration, Contract DA 36-039-sc-78097. [1959] 22p. 13 refs. AD-227 232.

DESCRIPTORS: Accelerators, *Betatrons, *Plasma physics, Electron tubes.

The Megatron, a 1000 amp, 150 Mev space charge neutralized betatron is described in detail. A beam intensity limitation for high beam current betatrons is stated and applied to the machine. The goal of 1000 amp is well within the limit set by this expression. (Author) (See also PB 162 075-3)

NYO-9864 $1.25

Technical Research Group, Inc., Syosset, N. Y.
SYNTHESIS OF SEMICONDUCTOR MATERIALS BY RADIATION INDUCED REACTIONS, by Kalman M. Held and Richard J. Goldman. Final rept. on Contract AT(30-1)-2392. 46p. 7 refs. TRG-132.

## Elementary Particles

NASA N62-10056 $1.60

City Coll. of the City of New York.
A POSSIBLE LAW FOR THE MASSES OF THE ELEMENTARY PARTICLES, by R. Mirman. Rept. on Grant NsG-177-62. [1962] 10p.

UCRL-10107 $2.50

Lawrence Radiation Lab., U. of California, Berkeley.
MEASUREMENT OF $\frac{G}{M}$ FOR MUONS, by Gordon McDonald Bingham. Doctoral thesis. Rept. on Contract W-7405-eng-48. May 62, 129p. 46 refs.

CTSL-34 $1.10

Synchrotron Lab., Calif. Inst. of Tech., Pasadena.
A NOTE ON THE LEPTONIC DECAYS OF THE K-MESON, by David H. Sharp and William G. Wagner. Rept. on Contract AT(11-1)-68. 21 June 62, 9p. 16 refs.

## Instruments and Installations

NASA N62-10050 $4.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
ON THE CORRELATION RADIOMETER TECHNIQUE, by K. Fujimoto. Rept. on Grant NsG-74-60. Jan 62, 49p. 13 refs. Rept. 1093-6.

HASL-129 $1.60

Health and Safety Lab., Atomic Energy Commission, New York.
FILTERS TO PROVIDE NEARLY MONOENERGETIC X-RAYS, by Arthur Shambon and Daniel Mirnick. July 62, 18p. 4 refs.

LA-2679 $0.50

Los Alamos Scientific Lab., N. Mex.
THE PHOTON ENERGY RESPONSE OF SEVERAL IONIZATION CHAMBER INSTRUMENTS, by Donald A. McKown and Ellery Storm. Rept. on Contract W-7405-eng-36. 18 July 62, 25p.

## Nuclear Engineering and Power

APAE-65 $22.25

Alco Products, Inc., Schenectady, N. Y.
NUCLEAR ANALYSIS PERFORMED ON SM-2 CORE AND VESSEL. Interim rept. 1 Sep 58-31 Dec 59, on Contract AT(30-3)-326. 27 May 60, 439p. 146 refs.

ANL-6458 $1.50

Argonne National Lab., Ill.
KINETICS OF TREAT USED AS A TEST REACTOR, by C. E. Dickerman, R. D. Johnson, and J. Gasidlo. Rept. on Contract W-31-109-eng-38. May 62, 60p. 16 refs.

NAA-SR-6801 $0.50

Atomics International, Canoga Park, Calif.
ANALYSIS OF RESULTS OF A SODIUM COLD TRAP EXPERIMENT, by J. S. McDonald. Rept. on Contract AT(11-1)-GEN-8. 30 June 62, 30p. 8 refs.

NAA-SR-7368 $0.75

Atomics International, Canoga Park, Calif.
SNAP SHIELD TEST EXPERIMENT REACTOR PHYSICS TESTS, by R. L. Tomlinson, R. P. Johnson, and S. G. Wogulis. Rept. on Contract AT(11-1)-GEN-8. 15 July 62, 35p. 8 refs.

NAA-SR-6264 $1.25

Atomics International, Canoga Park, Calif.
THEORETICAL KINETICS AND STRESSES FOR DELTA PHASE ISOTHERMAL HYDRIDING OF URANIUM ZIRCONIUM, by M. E. Nathan. Rept. on Contract AT(11-1)-GEN-8. 15 July 62, 48p. 15 refs.

BMI-1581(Del.) $2.00

Battelle Memorial Inst., Columbus, Ohio.
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING MAY, 1962, by Russell W. Dayton and Ronald F. Dickerson. Rept. on Contract W-7405-eng-92. 1 June 62, 81p.

WAPD-PWR-TE-143 $1.60

Bettis Atomic Power Lab., Pittsburgh, Pa.
POWER COASTDOWN FOLLOWING REACTOR SCRAM, by L. M. Swartz. Rept. on Contract AT(11-1)-GEN-14. 5 June 62, 11p. DLCS-3440201.

WAPD-MRP-98 $2.50

Bettis Atomic Power Lab., Pittsburgh, Pa.
PRESSURIZED WATER REACTOR(PWR) PROJECT. Technical progress rept. 24 Apr-23 June 62, on Contract AT(11-1)-GEN-14. 136p.

WAPD-TM-336 $0.75

Bettis Atomic Power Lab., Pittsburgh, Pa.
THE PROPERTIES OF HAFNIUM FROM A PWR CORE 1 CONTROL ROD AFTER ONE SEED LIFE EXPOSURE, by G. J. Salvaggio. Rept. on Contract AT(11-1)-GEN-14. June 62, 35p. 6 refs.

CVNA-90(Pt. B, Vol. II) $22.25

Carolinas Virginia Nuclear Power Associates, Inc., Columbia, S. C.
FINAL HAZARDS SUMMARY REPORT. PART B. LICENSE APPLICATION. VOLUME II. DESCRIPTION OF REACTOR AND NUCLEAR POWER PLANT. 11 Jan 62, 422p.

DP-745 $0.75

du Pont de Nemours, E. I., and Co., Wilmington, Del.
HEAVY WATER MODERATED POWER REACTORS, comp. by R. R. Hood and L. Isakoff. Progress rept. May 62, on Contract AT(07-2)-1. June 62, 34p. 51 refs.

GEMP-73 $2.00

General Electric Co., Cincinnati, Ohio.
REACTOR INSTRUMENTATION AND CONTROL. Progress rept. no. 73 on Contract AT(40-1)-2847. 31 July 62, 87p. 4 refs.

GEAP-3831 $1.00

General Electric Co., San Jose, Calif.
INVESTIGATION OF $B_4C$-NI ELECTRO DISPERSIONS FOR CONTROL ROD APPLICATIONS, by H. E. Williamson, D. L. Zimmerman, and K. C. Antony. Rept. on Contract AT(04-3)-189. 3 Nov 61, 39p. 7 refs.

HW-69027 $0.75

Hanford Atomic Products Operation, Richland, Wash.
DEMONSTRATION OF AN IRRADIATED $UO_2$ FUEL RECYCLE: FIRST RECYCLE, by J. L. Swanson, G. E. Benedict and others. Rept. on Contract AT(45-1)-1350. Sep 61, 24p. 1 ref.

NASA N62-10228 $4.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THERMAL AND CRITICALITY ANALYSIS OF THE PLASMA CORE REACTOR, by D. F. Spencer. Rept. on Contract NASw-6. 1 Jan 62, 46p. 8 refs. Technical rept. no. 32-189.

TID-16434 $3.60

Knolls Atomic Power Lab., Schenectady, N. Y.
STRUCTURAL EVALUATION OF REACTOR PRESSURE VESSELS, by Frank J. Mehringer. [1962] 37p. 35 refs.

NYO-9787 $13.00

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
SURVEY OF COMPONENT REQUIREMENTS AND AVAILABILITY FOR GAS-COOLED NUCLEAR REACTOR POWER PLANTS. DIRECT CLOSED CYCLES, by G. Novickis and Z. Zudans. Rept. on Contract AT(30-1)-2512. Nov 61, 188p. I-A2392-2.

UCRL 10122 $0.50

Lawrence Radiation Lab., California U., Berkeley.
BEVATRON OPERATION AND DEVELOPMENT. XXXI, by Walter D. Hartsough. Rept., Aug-Oct 61, on Contract W-7405-eng-48. 4 May 62, 15p.

NASA N62-14922 $0.75

Lewis Research Center, National Aeronautics and Space Administration, Cleveland, Ohio.
CRITICALITY EFFECTS OF CENTRALLY LOCATED TUBES AND RODS OF ALUMINUM, IRON, AND TUNGSTEN IN A HOMOGENEOUS REACTOR, by Daniel Fieno, Eugene Gunn and others. Aug 62, 28p. 4 refs. NASA TN D-1322.

LAMS-2593 $3.60

Los Alamos Scientific Lab., N. Mex.
A CALCULATION TO SIMULATE THE UNDERGROUND BERNALILLO SHOT, by Robert R. Brownlee. Rept. on Contract W-7405-eng-36. 7 Dec 61, 39p. 11 refs.

NASA N62-14720 $2.25

Marshall Space Flight Center, National Aeronautics and Space Administration, Huntsville, Ala.
NUCLEAR RADIATION TRANSFER AND HEAT DEPOSITION RATES IN LIQUID HYDROGEN, by M. O. Burrell. Aug 62, 97p. 8 refs. NASA TN D-1115.

MND-M-1817 $19.75

Martin [Marietta Corp., ] Baltimore, Md.
PM-1 NUCLEAR POWER PLANT PROGRAM. Quarterly progress rept. no. 6, 1 June-31 Aug 60, on Contract AT(30-1)-2345. 5 July 60, 346p. 25 refs.

MND-M-1866 $2.75

Martin [Marietta Corp.] Baltimore, Md.
PM-1 REACTOR CORE FINAL DESIGN REPORT, by R. O. Bagley, F. H. Cox., and others. Rept. on Contract AT(30-1)-2345. Jan 62, 200p. 11 refs.

MND-M-2343 $6.60

Martin [Marietta Corp.] Baltimore, Md.
REACTOR FLOW STUDIES: FUEL TUBE BUNDLE FLOW TESTS, by W. J. Taylor, R. Baer, and M. P. Norin. Rept. on Contract AT(30-1)-2345. July 60, 71p.

MND-M-1916 $11.50

Martin [Marietta Corp.] Baltimore, Md.
REACTOR FLOW STUDIES: QUARTER SCALE FLOW MODEL TESTS, by W. J. Taylor and I. Starr. Rept. on Contract AT(30-1)-2345. Apr 60, 146p.

ORNL-TM-280 $3.60

Oak Ridge National Lab., Tenn.
AN ANALYSIS OF OPERATIONS DIVISION TRAINING PROGRAMS, by E. N. Cramer. Rept. on Contract W-7405-eng-26. 27 Aug 62, 38p. 8 refs.

ORNL-3306 $12.50

Oak Ridge National Lab., Tenn.
THE ANGULAR DISTRIBUTION OF FISSION FRAGMENTS FROM THE FAST NEUTRON INDUCED FISSION OF U-234, by R. W. Lamphere. 27 Aug 62, 174p. 79 refs.

ORNL-TM-279 $9.60

Oak Ridge National Lab., Tenn.
THE OAK RIDGE RESEARCH REACTOR (ORR), THE LOW INTENSITY TESTING REACTOR (LITR) AND THE OAK RIDGE GRAPHITE REACTOR (OGR) AS EXPERIMENT FACILITIES, by Kenneth D. George. Rept. on Contract W-7405-eng-26. 28 Aug 62, 115p. 51 refs.

ORNL-TM-275 $8.10

Oak Ridge National Lab., Tenn.
PROBLEMS ENCOUNTERED DURING FOUR YEARS OF ORR OPERATION, by W. H. Tabor and R. A. Costner, Jr. Rept. on Contract W-7405-eng-26. 23 Aug 62, 87p. 14 refs.

ORNL-TM-283 $3.60

Oak Ridge National Lab., Tenn.
REACTOR CONTROLS RELIABILITY AND MAINTENANCE AT THE ORR, by K. W. West. Rept. on Contract W-7405-eng-26. 28 Aug 62, 34p. 3 refs.

TID-7631 $5.00

Oak Ridge National Lab., Tenn.
ROTATING MACHINERY FOR GAS-COOLED REACTOR APPLICATION. PROCEEDINGS OF MEETING AT OAK RIDGE NATIONAL LABORATORY, APRIL 2-4, 1962. June 62, 411p. 67 refs.

ORNL-TM-273 $2.60

Oak Ridge National Lab., Tenn.
VAPOR CONTAINMENT IN THE OAK RIDGE RESEARCH REACTOR, by F. T. Binford. Rept. on Contract W-7405-eng-26. 23 Aug 62, 29p. 16 refs.

IDO-16755 $5.00

Phillips Petroleum Co., Idaho Falls.
CONTRIBUTIONS TO TWO PROBLEMS IN SPACE INDEPENDENT, NUCLEAR REACTOR DYNAMICS: I. CALCULATION AND MEASUREMENT OF THE REACTOR DESCRIBING FUNCTION. II. ANALYSIS OF THE EFFECT OF A REFLECTOR ON REACTOR DYNAMICS, by A. A. Wasserman. Rept. on Contract AT(10-1)-205. 30 Mar 62, 410p. 49 refs.

DP-703 $0.75

Savannah River Lab., Aiken, S. C.
DECONTAMINATION OF REACTOR HEAT EXCHANGERS SAVANNAH RIVER PLANT, by C. A. Meyer. Rept. on Contract AT(07-2)-1. May 62, 28p. 1 ref.

PB 162 075-3 $1.10

Stevens Inst. of Tech., Hoboken, N. J.
MEGATRON ACCELERATOR, by K. C. Rogers, G. Brucker and others. Quarterly progress rept. no. 3, 1 Jan-31 Mar 59, on Investigation of Plasma Acceleration, Contract DA 36-039-sc-78097. [1959] 10p. AD-216 741.

DESCRIPTORS: Accelerators, *Betatrons, *Plasma physics, Electron tubes, Vacuum switches, *Transmission lines, Dielectric properties, Capacitors.

A modification to improve the dielectric strength of the transmission lines in the Stevens Institute 100,000 joule fast capacitor bank is described. A low-jitter pulser for application to plasma switch firing is discussed. (Author) (See also PB 162 075-2)

WCAP-1737 $3.60

Westinghouse Electric Corp., Pittsburgh, Pa.
PRELIMINARY CORE DESIGN OF A 500 KWe THERMOELECTRIC REACTOR, by R. A. Markley and E. G. Schwartz. Rept. on Contract AT(30-3)-500. Mar 61, 38p. 3 refs.

WCAP-1680 $4.60

Westinghouse Electric Corp., Pittsburgh, Pa.
RADIATION EFFECTS ON THERMOELECTRIC MATERIALS, by G. R. Kilp and P. V. Mitchell. Rept. on Contract AT(30-3)-500. May 61, 50p. 9 refs.

## Nuclear Reactions

TID-12696 $1.10

Argonne National Lab., Ill.
MEASUREMENTS OF (p, n) CROSS SECTIONS ON Cu AT 9.85 MEV, by G. A. Jones, J. P. Schiffer and others. 3 Mar 61, 9p. 7 refs.

UCRL-10175 $2.25

Lawrence Radiation Lab., U. of California, Berkeley.
K-PROTON INTERACTIONS NEAR 400 MeV/c, by Mason B. Watson. Doctoral thesis. Rept. on Contract W-7405-eng-48. Sep 62, 109p. 19 refs.

UCRL-10129 $2.00

Lawrence Radiation Lab., U. of California, Berkeley.
SEARCH FOR MULTIPION RESONANCES IN THE REACTION $\bar{p} + p \rightarrow 3\pi^+ + 3\pi^- + n\pi^0$, by Nguyen-Huu Xuong. Rept. on Contract W-7405-eng-48. 21 Mar 62, 88p. 42 refs.

## Radioactivity

KY-419 $0.50

Union Carbide Nuclear Co., Paducah, Ky.
ENVIRONMENTAL MONITORING SUMMARY FOR THE PADUCAH PLANT FOR 1961, by E. G. Brown and R. C. Baker. Rept. on Contract W-7405-eng-26. 20 July 62, 14p. 3 refs.

TID-16268 $3.60

Yale U., New Haven, Conn.
A SYSTEM FOR THE SIMULTANEOUS DETECTION OF TWENTY POSITRON EMITTING SOURCES, by F. C. Jobes, J. A. McIntyre, and L. C. Becker. 11 July 62, 32p. 7 refs.

## PHYSICS

ANL-6515 $3.50

Argonne National Lab., Ill.
SECOND SYMPOSIUM ON PHYSICS AND NONDESTRUCTIVE TESTING, ed. by Roberta Ann Novi. Held at Argonne National Laboratory, October 3, 4, 5, 1961. Rept. on Contract W-31-109-eng-38. 263p. 155 refs.

WAPD-TM-294 $0.50

Bettis Atomic Power Lab., Pittsburgh, Pa.
APPLICATIONS OF THE SIMPLIFIED SPHERICAL HARMONICS EQUATIONS IN SPHERICAL GEOMETRY, by Ely M. Gelbard. Rept. on Contract AT(11-1)-GEN-14. Apr 62, 9p. 1 ref.

WAPD-T-1450 $3.60

Bettis Atomic Power Lab., Pittsburgh, Pa.
A COMPARISON OF A SELF-ADJOINT VARIATIONAL METHOD TO 36-GROUP THERMAL SPECTRUM CALCULATIONS OF HETEROGENEOUS SYSTEMS, by S. L. Shufler. Rept. on Contract AT(11-1)-GEN-14. Apr 62, 35p. 6 refs.

WAPD-TM-265 $1.00

Bettis Atomic Power Lab., Pittsburgh, Pa.
ISOTOPIC ANALYSIS OF IRRADIATED NATURAL URANIUM DIOXIDE FUEL RODS FROM PWR CORE 1, by C. D. Sphar. Rept. on Contract AT(11-1)-GEN-14. Feb 62, 50p. 21 refs.

BNL-735(T-264) $2.25

Brookhaven National Lab., Upton, N.Y.
THREE LECTURES ON ELEMENTARY PARTICLE RESONANCES, by R.H. Dalitz. Dec 61, 99p. 65 refs.

NYO-9191 $2.60

Institute of Mathematical Sciences, New York U., N. Y.
SHERWOOD, by J. Berkowitz. Progress rept. no. 5, Jan-Dec 61, on Contract AT(30-1)-1480. 16 Apr 62, 21p. 55 refs. MF-30.

NASA N62-15557 $2.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A SENSITIVE AUTOMATIC TORQUE BALANCE FOR THIN MAGNETIC FILMS, by F. B. Humphrey and A. R. Johnson. Rept. on Contract NAS7-100. 10 Aug 62, 24p. 36 refs. Technical rept. no. 32-321.

UCRL-6809 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
EMISSION CHARACTERISTICS OF TANTALUM, TUNGSTEN, RHENIUM AND IRIDIUM IN PLASMA DIODES, by William H. Gust. Rept. on Contract W-7405-eng-48. 15 Mar 62, 25p. 9 refs.

UCRL-6891 $2.00

Lawrence Radiation Lab., U. of California, Livermore.
GAMMA ENERGY DEPOSITION IN INFINITE SOURCE MEDIA, by Alex Lorenz. Master's thesis. Rept. on Contract W-7405-eng-48. 15 May 62, 76p. 15 refs.

PB 159 646 $6.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
SIGNAL FLOW GRAPH TECHNIQUES, by J. L. Burroughs and W. W. Happ. 20 Oct 59, 64p. 14 refs. LMSD-288059.

DESCRIPTORS: *Circuits, Statistical analysis, *Signals, Transmission, Inverter circuits, Reduction, Determinants.

Techniques are developed for representing lumped-parameter physical systems by oriented graphs called signal flow graphs. Methods of (a) formulating, (b) reformulating, and (c) evaluating a signal flow graph are derived from commonly known algebraic relations. A new procedure for condensing signal flow graphs relating large numbers of variables is developed and demonstrated. (Author)

NASA N62-15700 $1.60

Naval Research Lab., Washington, D. C.
HIGH-INTENSITY REPRODUCIBLE-CONTINUUM LIGHT SOURCE FOR ABSOLUTE INTENSITY CALIBRATION, by R. C. Elton, H. R. Griem, and A. C. Kolb. Rept. on NASA Order R-9. [1962] 14p.

NASA N62-15335 $1.60

Naval Research Lab., Washington, D. C.
RADIATION FROM HIGH-TEMPERATURE COLLISION-DOMINATED PLASMAS, by Hans R. Griem and Alan C. Kolb. Rept. on NASA Order R-9. [1962] 17p. 14 refs.

NASA N62-14859 $2.75

Marshall Space Flight Center, National Aeronautics and Space Administration, Huntsville, Ala.
STUDIES IN FAR-FIELD ACOUSTIC PROPAGATION, by Richard N. Tedrick, Roy Peterson and others. Aug 62, 128p. 27 refs. NASA TN-D-1277.

IDO-16766 $0.75

Phillips Petroleum Co., Idaho Falls.
CALCULATION OF THE VIBRATIONAL FREQUENCIES OF ETHYLENE, by R. W. Goin. Master's thesis. Rept. on Contract AT(10-1)-205. 15 May 62, 35p. 9 refs.

IDO-16769 $1.00

Phillips Petroleum Co., Idaho Falls.
PROPANE VIBRATIONAL ANALYSIS, by G. D. Marshall. Rept. on Contract AT(10-1)-205. 12 June 62, 44p.

NYO-9811 $1.10

Westinghouse Research Labs., Pittsburgh, Pa.
ULTRAHIGH VACUUM TECHNIQUES. Quarterly progress rept. 1 Apr-30 June 62, on Contract AT(30-1)-2823. 31 July 62, 9p. Research rept. 62-928-441-R1.

## Molecular Physics and Spectroscopy

UCRL-6925 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
AN UPPER LIMIT TO THE PRODUCTION OF $H^+$ FROM $H_2$ BY ELECTRON BOMBARDMENT, by G. O. Brink and F. S. Baker. Rept. on Contract W-7405-eng-48. 1 June 62, 8p. 9 refs.

NASA N62-15696 $1.60

Naval Research Lab., Washington, D. C.
THE MEASUREMENT OF HELIUM OSCILLATOR STRENGTHS USING AN ELECTROMAGNETIC SHOCK TUBE, by E. A. McLean. Rept. on NASA Order R-9. [1961] 15p. 24 refs.

PB 160 405 $1.60

Naval Medical Research Inst., Bethesda, Md.
SOME STATISTICAL PROBLEMS CONCERNING LINEAR MACROMOLECULES, by Terrell L. Hill. Vol. 14, p. 707-724. 12 Sep 56, 19p. 6 refs. Research rept. on Project NM 000 018.06.52.

DESCRIPTORS: Statistical analysis, *Matrix algebra, *Linear systems, Molecular structure, *Molecular association, *Ferromagnetism.

The matrix method which has been employed in the theory of ferromagnetism is potentially very useful in treating statistical problems concerning linear macromolecules with repeating units. The method is reviewed briefly and applied to seven illustrative problems (two of which are not worked out completely) Six of these involve ion binding or titration curves of polyelectrolytes and one has to do with the question of imperfections (missing hydrogen bonds) in the α-helix. (Author)

NASA N62-15282 $2.60

Naval Research Lab., Washington, D. C.
STARK BROADENING OF ISOLATED SPECTRAL LINES FROM HEAVY ELEMENTS IN A PLASMA, by Hans R. Griem. Rept. on NASA Order R-9. [1962] 30p. 21 refs.

## Solid State Physics

ANL-6519 $0.75

Argonne National Lab., Ill.
CRYSTALLOGRAPHIC D-SPACE COMPUTER PROGRAM, by M. H. Mueller, E. F. H. Meyer, and S. H. Simonsen. Rept. on Contract W-31-109-eng-38. Apr 62, 28p. 3 refs.

PB 162 111 $1.60

Frankford Arsenal, Philadelphia, Pa.
THE FORMATION OF THIN FILMS. A REVIEW, by R.J. Esposito. Aug 60, 19p. 31 refs. Memo rept. M61-11-1; AD-253 603.

DESCRIPTORS: *Thin films, Surfaces, Vapors, Vaporization, *Alloys, Evaporation, Surface properties, Crystals, *Metallic crystals, Lattices, Crystal structure, Theory, Electron diffraction analysis, X-ray diffraction analysis, Temperature, Dissociation, Molecules, *Bibliography, Metals, Atoms, Pressure.

A survey was made of available literature to investigate the parameters affecting alloy formation in thin films, and a review is given of the parameters affecting the formation of a thin layer. These parameters are: (1) choice of a material to be evaporated, its composition in the vapor phase, and its impinging intensity onto the substrate; (2) substrate cleanliness, structure, and temperature; and (3) vacuum pressure of the system. The emphasis centers about the nucleation and growth of a deposit, starting from the explanations of early workers, such as Langmuir and Frenkel, and continuing to the work of present theorists, such as Frank, van der Merwe, and Pashley. This is supplemented by a succinct account of experimental work, including values of the dissociation energies of some well known diatomic compounds as given by Gaydon. (Author)

PB 160 979 $1.10

General Atomic Div., General Dynamics Corp., San Diego, Calif.
HIGH TEMPERATURE BROAD BAND SEMICONDUCTORS, by S. W. Kurnick. Monthly progress rept. for Oct 59, on Contract NObs-77144. 30 Oct 59, 7p. 2 refs. ARPA Order no. 81-59.

DESCRIPTORS: *Semiconductors, Broadband, High temperature research, *Cerium compounds, Sulfides, *Magnesium compounds, *Nickel compounds, Oxides, Synthesis, Electrical properties, Hall effect, Test methods

Thermoelectric, conductive and galvanomagnetic properties of high temperature broad-band semiconductors are being studied. Particular stress was laid upon synthesis, and electrical measurements, of the Ce-S semiconductors $Ce_{2+x}S_{3+x}$ where $0<x<1$. A second system under investigation is the $Mg_{1-x}Ni_xO$ system.

PB 160 980 $1.10

General Atomic Div., General Dynamics Corp., San Diego, Calif.
HIGH TEMPERATURE BROAD BAND SEMICONDUCTORS, by S. W. Kurnick. Progress rept. 1 Nov-31 Dec 59, on Contract NObs-77144. 15 Jan 60, 9p. ARPA Order no. 81-59; AD-245 879.

DESCRIPTORS: *Semiconductors, Broadband, Theory, Electrical properties, Conductivity, Temperature, Mechanical properties, Refractory materials, *Materials

The investigation of thermoelectric conversion at high temperatures by semiconductors has become an important phase of new material research. In addition, some of these high temperature semiconductors involve transport mechanisms different from such conventional semiconductors as Ge, Si and InSb, and are also less well understood. New tools and equipment were developed and constructed for such studies up to temperatures as high as 1800 K. This first phase is now complete. Present emphasis is on material preparation and evaluation. To augment the experimental program, theoretical interpretations of the various transport mechanisms were made. (Author) (See also PB 160 979)

PB 160 981 $7.60

General Atomic Div., General Dynamics Corp., San Diego, Calif.
HIGH-TEMPERATURE BROAD-BAND SEMICONDUCTORS. Semiannual technical summary rept. 11 May-31 Dec 59, on Contract NObs-77144. 18 Feb 60, 72p. 36 refs. Rept. nos. GA-1226, GAMD-1091 and GAMD-882, ARPA Order no. 81-59; AD-240 541.

DESCRIPTORS: *Semiconductors, Broadband, Metallic compounds, Oxides, Analysis, Electrical properties, Magnetic properties, Temperature

Contents:
Thermal and electrical properties of the Cerium Sulfur$_{3+x}$ ($2+x$) ($0 \leq x \leq 1$) semiconductors
Wide-band materials
Theoretical work on scattering mechanisms
Thermoelectric measurements at small-area contacts
A comparison of the thermoelectric properties of certain conduction mechanisms in solids (GAMD-1091)
Phenomenology of impurity conduction in semiconductors (GAMD-882)
Electrical properties of Germanium at low temperatures
Electrical properties of other semiconductors in the impurity-conduction range
Phenomenological description
(See also PB 160 979)

PB 160 982 $2.60

General Atomic Dic., General Dynamics Corp., San Diego, Calif.
HIGH-TEMPERATURE BROAD-BAND SEMICONDUCTORS. Quarterly technical summary rept. 1 Jan-31 Mar 60, on Contract NObs-77144. 29 Apr 60; on Contract NObs-77144. 29 Apr 60, 28p. 11 refs. Rept. no. GA-1377; ARPA Order no. 81-59; AD-245 051.

DESCRIPTORS: *Semiconductors, Broadband, Narrowband, Metallic compounds, Dielectric properties, Optics, Temperature, Sulfides, Cesium compounds, Rare earth compounds, Oxides, Zirconium compounds, Aluminum compounds, Borides, Thorium compounds, Thermoelectricity, Electrical conductance, Electrical properties.

The semiconductor classes which have been most thoroughly investigated so far are those with a large forbidden gap and a narrow conduction band. In the first class the narrow band is located energetically near the wide conduction band; the light rare earth sulfides $CeS_{1.33-1.50}$ and the heavy rare earth sulfides $ThS_{1.71-1.76}$ are examples. To these, controlled doping may be introduced to alter the thermoelectric properties. The doping agents used in these experiments are barium and tantalum. Examples of the second semiconductor class, in which there is a large forbidden gap and a narrow conduction band far from the wide band, include aluminum boride and the solid solutions of zirconium oxides with oxides of calcium, magnesium, uranium, and yttrium. The most extensive measurements during the report period have been made on the Ce-S semiconductors. Although these semiconductor studies are not complete, sufficient evidence has been observed for a better understanding of the energy level configuration and transport mechanism of these compounds. In addition, conductivity studies have also been underway on $AlB_{12}$ semiconductors. (Author) (See also PB 160 981)

PB 160 983 $2.60

General Atomic Div., General Dynamics Corp., San Diego, Calif.
HIGH-TEMPERATURE BROAD-BAND SEMICONDUCTORS, by S. W. Kurnick, J. C. Appel, and M. Cutler. Quarterly technical summary rept. 1 Apr-30 June 60, on Contract NObs-77144. 22 July 60, 25p. 10 refs.
Rept. no. GAMD-1529; ARPA Order no. 81-59; AD-245 978.

DESCRIPTORS: *Semiconductors, Broadband, Cerium compounds, Sulfides, Thorium compounds, *Heat transfer, Electrical conductance, Electrical properties, Preparation, Lattices, Thermoelectricity, Measurement Thermodynamics, Theory.

The Ce-S and Th-S semiconductor materials are being intensively studied because their low lattice thermal conductivities and chemical stability at high temperatures make them promising materials for thermal conversion. An important part of the intensive study of these compounds is the determination of the nature of their electrical and thermal transport phenomena, parameters which are relatively unknown as compared to those of semiconductor materials such as germanium, silicon, and lead telluride. One of the most significant aspects of the program is the measurement of thermal conductivity by a small-area-contact technique. In this technique, measurements of thermal conductivity at high temperature, usually difficult to make, are readily performed on minute, irregularly-shaped specimens as small as 0.2 $cm^3$. (Author) (See also PB 160 982)

PB 160 987 $1.10

General Atomic Div., General Dynamics Corp., San Diego, Calif.
HIGH TEMPERATURE BROAD-BAND SEMICONDUCTORS, by Melvin Cutler. Quarterly technical summary rept. 1 Jan-31 Mar 62, on Contract NObs-77144. 5 Apr 62, 6p. Rept. no. GACD-3077; ARPA Order no. 81-59.

DESCRIPTORS: *Semiconductors, Broadband, High temperature research, *Thermoelectricity, *Rare earths, Lanthanum compounds, Oxides, *Cerium compounds, Sulfides.

After examining a few rare-earth oxides which were found to be n-type, some effort was spent in investigating a group of compounds reported by Foex, (Bull. Soc. Chim. France 1961 109) which may have potential thermoelectric interest and which are p-type. Experiments have been continued with the aim of obtaining accurate data as a function of composition and temperature for cerium sulfide. Measurements of the thermoelectric parameters have been extended below room temperature down to liquid air temperatures. (See also AD-278 406)

NASA N62-10135 $11.50

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ORGANIC SEMICONDUCTORS: PROPERTIES AND APPLICATIONS, by Dorothy I. Sweitzer. Rept. on Contract NASw-6. 1 Sep 61, 159p. 805 refs. Astronautics Information Literature Search no. 341.

LAMS-2706 $1.75

Los Alamos Scientific Lab., N. Mex.
RADIATION EFFECTS ON SEMICONDUCTOR DEVICES, comp. by Carroll Sue Schwiening. Rept. on Contract W-7405-eng-36. 9 Aug 62, 71p.

PB 162 214 $2.60

Pacific Semiconductors, Inc., Culver City, Calif.
STUDY OF SURFACES IN SEMICONDUCTOR DEVICES, by T. C. Hall. Quarterly technical rept. no. 2, 1 July-30 Sep 57, on Contract DA 36-039-sc-73229. 11 Oct 57, 22p. Rept. no. 3000:8-6-Q; AD-149 257.

DESCRIPTORS: *Semiconductors, Surface properties, Polymers, Films, Copolymerization, Polymerization, Junction boxes, Silicon.

Efforts to increase the long-term stability of organosilicon polymer films attached to silicon surfaces have produced improved results. Co-polymerization of various simple monomers with more complicated cross-linking monomers has led to the production of films in which the degree of internal structuring can be controlled. The progressive build-up of stress leading to film cracking and the simultaneous creation of electrical leakage paths in surface-treated junctions is apparently reduced. Ultimately some degradation is observed, however. A summary of data on groups of surface-treated junctions is presented. This data indicates that leakage and structural degradation (cracking) in the film are parallel effects. The lack of effect of surface films on reverse breakdown voltage indicates the probable of surface field or "channel" phenomena. The existing and contemplated physical laboratory and instrumentation facility is described. (Author) (See also PB 162 213)

PB 162 158 $5.60

Purdue Research Foundation, Lafayette, Ind.
SEMICONDUCTOR RESEARCH, by H. Y. Fan, J. R. Beacham and others. Quarterly rept. no. 16, 1 May-31 July 60, on Contract DA 36-039-sc-71131. [1960] 59p. Rept. no. PRF 1258; AD-245 096.

DESCRIPTORS: *Semiconductors, Silicon, Germanium, *Crystals, Indium, Infrared detectors, Perturbation theory, Impurities, Single crystals, Radiation damage, Low temperature research, Electrical properties, Paramagnetic resonance, Specific heat

Contents:
Electrical and optical properties
Hot carrier conductivity studies in p-type germanium
Electric field induced hot carrier modulation of infrared radiation
Impurity conduction in silicon
Microwave conductivity of semiconductors
Infrared absorption in gallium antimonide
Hall coefficient analysis in single crystal tellurium
Irradiation effects
Infrared absorption in irradiated silicon
K-band superheterodyne spectrometer
Paramagnetic resonance in irradiated silicon
Low temperature studies
Specific heat of germanium
Electrical resistivity of germanium at very low temperatures
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Transport properties of germanium at low temperatures
General
Intensities of Zeeman patterns of acceptor states
Dislocation investigations
Dislocation free germanium crystals
(See also PB 146 497)

## Thermodynamics

NAA-SR-MEMO-7182 $1.10

Atomics International, Canoga Park, Calif.
ANALYSIS OF VARIABLE GAS BOND FOR CONTROL OF HEAT FLOW ACROSS AN ANNULUS, by R. C. Noyes. 5 Mar 62, 9p. 2 refs.

NAA-SR-MEMO-6907 $2.60

Atomics International, Canoga Park, Calif.
CRITICAL HEAT FLUX OF SANTOWAX R IN FORCED CONVECTION, by J. M. Robinson. 4 May 62, 23p. 10 refs.

NAA-SR-MEMO-4325 (rev. 1) $1.60

Atomics International, Canoga Park, Calif.
EFFECT OF REACTOR CORE LENGTH ON HEAT TRANSFER, HYDRAULIC, AND OTHER CORE PARAMETERS, by T. T. Shimazaki. 18 Jan 62, 14p.

NAA-SR-MEMO-6938 $2.60

Atomics International, Canoga Park, Calif.
TRANSIENT AND STEADY-STATE TEMPERATURES IN A ONE-BARREL CASK DURING LOSS OF FLOW OF HELIUM, by W. A. Schumann. 9 Dec 61, 26p.

UCRL-6807 $0.75

Lawrence Radiation Lab., California U., Livermore.
FLUID MECHANICS AND HEAT TRANSFER FOR GASES (AIR, He, $H_2$ AND $N_2$) FLOWING SINGLE PHASE IN CLOSED CHANNELS, Bibliography by Rose Kraft. Rept. on Contract W-7405-eng-48. 21 Feb 62, 31p.

LAMS-2701 $0.50

Los Alamos Scientific Lab., N. Mex.
THE $T_{62}He^3$ TEMPERATURE SCALE. IV. TABLES, by R. H. Sherman. Rept. on Contract W-7405-eng-36. July 30, 1962, 23p. 10 refs.

PB 162 102 $3.60

Rocketdyne, Canoga Park, Calif.
RESEARCH IN HYBRID COMBUSTION, by R. E. Bell, M. V. Peck, and K. H. Mueller. Quarterly rept. for period ending 28 Feb 61, on Contract [Nonr]-3016(00). 6 Apr 61, 38p. 20 refs. Rept. no. R-2267-3; AD-254 618.

DESCRIPTORS: *Combustion, *Acrylic resins, *Rocket motors, Polymers, Methyl radicals, Temperature, Oxygen, Energy, Gas flow, Gases, Solids.

The combustion processes of polymethylmethacrylate in a hybrid system were studied. Surface temperatures, burning rates and reaction products were determined. The effect of oxygen atmosphere upon the activation energy of the depolymerization reaction also was studied. A qualitative description of the probable mechanism for hybrid combustion is proposed. (Author)

## Wave Propagation

NASA N62-14637 $3.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
REFLECTION OF CIRCULARLY POLARIZED RADAR WAVES FROM A VERY ROUGH SURFACE, by H. F. Mathis. Rept. on Grant NsG-213-61. 15 May 62, 35p. 2 refs. Rept. 1388-3.

NASA N62-10046 $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
LANDAU DAMPING OF TRANSVERSE WAVES IN THE EXOSPHERE BY FAST PARTICLE FLUXES, by D. A. Tidman and R. K. Jaggi. Rept. on Contract Nsg-220-62. Feb 62, 20p. 13 refs. Technical note BN-277.

NASA N62-10055 $6.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
WAVE MOTION IN A PLASMA WITH ANISOTROPIC PRESSURE, by R. K. Jaggi. Rept. on Contract NsG-220-62. Feb 62, 62p. 15 refs. Technical note BN-278.

NASA N62-15862 $3.60

Lockheed-California Co., Burbank.
GEOMETRIC ATTENUATION OF HYDROMAGNETIC WAVES IN THE EARTH'S ATMOSPHERE, by Erich J. Stegelmann and Carl H. H. von Kenschitzki. Final rept. on Contract NASw-256. Jan 62, 36p. LR-15702.

NASA N62-10113 $1.60

Rensselaer Polytechnic Inst., Troy, N. Y.
SEMIANNUAL STATUS REPORT NO. 3, by E. Howard Holt. Rept. for 1 Nov 60-30 Apr 61, on Grant NsG-48-60. May 61, 10p. 9 refs.

# RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

NASA N62-10268 $8.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RESEARCH SUMMARY NO. 36-11. Rept. for 1 Aug-1 Oct 61 on Contract NASw-6. Nov 61, 95p. 88 refs.

## Communication Theory

NASA N62-10213 $3.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
AN EXPERIMENTAL 960-mc MASER AMPLIFIER SYSTEM APPLICABLE TO SPACE COMMUNICATIONS, by C. Stelzried, D. Schuster, and T. Sato. Rept. on Contract NASw-6. 15 Nov 61, 34p. 9 refs. Technical rept. no. 32-179.

SCR-520 $2.60

Sandia Corp., Albuquerque, N. Mex.
OPTICAL MASERS FOR COMMUNICATION AND RECONNAISSANCE, by G. C. Dacey. May 62, 21p. 9 refs.

PB 162 082 $11.00

Stanford U., Calif.
AN ECONOMETRIC INVESTIGATION OF THE SIZE DISTRIBUTION OF LIFETIME AVERAGE ANNUAL INCOME, by Robert Summers. Technical rept. no. 31 on Contract N6onr-25133. 1 Mar 56, 142p. 32 refs. AD-89-983.

DESCRIPTORS: Statistical processes, *Money, Economics, *Economic conditions.

A plan is presented for estimating the size distribution of lifetime average annual income. The statistical estimation process consists of (1) the selection of an appropriate functional form for the relationship between a spending unit's income in a given year and its income in previous years, given its age and the state of the economy; and (2) the estimation of the parameters of the functional form. A description is presented of the income-dynamics of spending units. The income-dynamics description is used as a basis for estimating the size distributions of lifetime average annual income.

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